HOWE

Rapid Freeze

SERVICE MANUAL

and parts catalog

Selective Purpose Flake Ice Machines

2000 - 20000 lb. Seawater Models

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Notice

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The information contained herein is applicable to the specified models current at the time of publication. Some information in this manual will be of use to owners of older model machines. The reader is cautioned that use of this manual with older equipment is at the user's risk. Howe Corporation makes no warranty or guarantee, explicit or implicit with regard to the use of this manual with equipment models outside the scope of this manual. If in doubt of the scope of this manual, contact Howe Corporation.

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1 Introduction

Strategic Vision

The Rapid Freeze by Howe Flaker is backed by over 50 years of proven performance and innovation. Long known for durability and reliability, our flake ice equipment is unsurpassed in energy efficiency and low maintenance.

Available in a wide variety of sizes and configurations, the rugged Rapid Freeze Flaker can be found in diverse applications from supermarkets and food processors to remote fishing villages.

Rapid Freeze Energy Efficiency

The Rapid Freeze Flake Ice Machine enjoys a world renowned reputation for having one of the highest energy efficiency rating (EER) of any ice maker on the market. With energy usage of 30% - 40% below that of many competitors' models, the Rapid Freeze ice machine offers an outstanding value.

In addition to high energy efficiency, the Rapid Freeze Flaker is extremely dependable with very low maintenance cost. Overall, the cost of owning and operating a Rapid Freeze Flaker by Howe, is one of the lowest in the industry.

Important Safety Information

The information found in this manual is intended for use by individuals possessing adequate backgrounds of electrical, refrigeration and mechanical experience. Any attempt to repair or make alterations to this equipment may result in personal injury or property damage. The manufacturer or seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

Special Precautions To Be Observed When Charging Refrigeration Systems

Only technically-qualified persons, trained and certified in the handling of refrigerant and operation of refrigeration systems, should perform the operations described in this manual.

If a refrigeration system is being charged from refrigerant cylinders, disconnect each cylinder when empty or when system is fully charged. A gauge should be installed in the charging line to indicate the refrigerant cylinder pressure. The cylinder may be considered empty of liquid R-22 refrigerant when the gauge pressure is 25 psi or less, and there is no frost on the cylinder. Close the refrigerant charging valve and cylinder valve before disconnecting the cylinder. Loosen the union in the refrigerant line, SLOWLY and CAREFULLY, to relieve refrigerant pressure in the charging hose.

1 Introduction

***** WARNING *****

Never open charging valve allowing refrigerant to vent directly to atmosphere. Refrigerant must be reclaimed through a recovery system.

***** WARNING *****

Always store cylinders containing refrigerant in a cool place. They should never be exposed to temperatures higher than 125°F (52°C) and should be stored and secured in a manner to prevent abnormal mechanical shocks.

Safety Symbols & What They Mean

Please read and understand this manual prior to installing or operating this Rapid Freeze® Ice Flaker. You must be completely familiar with the start-up, operation and service of this flaker BEFORE you attempt to start, operate or adjust this piece of equipment.

These safety symbols will alert you to any special precautions throughout this manual.

***** DANGER *****

BEWARE OF HAZARDS WHICH CAN RESULT IN PERSONAL INJURY

***** DANGER *****

***** WARNING *****

"DO IT RIGHT" OR RISK SEVERE PERSONAL INJURY.

FOLLOW INSTRUCTIONS.

***** WARNING *****

***** CAUTION *****

BE CAREFUL NOT TO HURT YOURSELF OR TO DAMAGE THE EQUIPMENT.

FOLLOW INSTRUCTIONS.

***** CAUTION *****

1 Introduction

***** CAUTION *****

Only service personnel experienced in refrigeration and qualified to work with high voltage electrical equipment should be allowed to install or service this Rapid Freeze Ice Flaker.

***** CAUTION *****

Upon receipt of your Rapid Freeze Ice Flaker, you should first inspect the carton very carefully to determine if any damage may have occurred during shipment. If you suspect any damage has occurred, it should be noted immediately on the freight bill. In addition, a separate written notice must be sent to the agent representing the freight carrier. The written notice should request an inspection by the agent to verify damage during shipment. If the damage was noticed after un-crating of the carton, it is necessary to keep the original shipping container so the carrier's agent can investigate the damage claim thoroughly.

If a repair is necessary for the Rapid Freeze machine, you must first obtain written permission from the factory before beginning any repairs. Unauthorized work on your Rapid Freeze Ice Flaker could result in voiding the machine's warranty.

Seawater units are shipped with a holding charge of dry nitrogen to ensure the evaporator is kept clean and moisture free. They must be pumped down and evacuated after they are connected to the refrigeration system, before the entire system is charged with its refrigerant charge.

Immediately upon receipt of equipment, before placement or installation of equipment, verify the electrical, and refrigerant configuration are correct as ordered. If any discrepancies are found, notify Howe Corporation immediately prior to any installation.

3 Installing the Rapid Freeze Flaker

Installation Conditions

Rapid Freeze Ice Flakers are designed to operate in ambient temperatures warmer than 50°F. Do not install ice flaker(s) in refrigerated cold rooms or in areas where the ambient temperature is lower than 50°F (10°C). If it is unavoidable, ice flakers may be installed in areas down to 45°F (7°C) provided that three (3) electric rib heaters (available from the factory) are installed to heat the bottom casting to prevent ice buildup on the three supporting ribs for the bottom bearing. If installed in cold ambient conditions, it is advisable to supply the ice flaker with warmer water through a water mixing valve, around 60°F (15°C).

When a combination of cold water and cold air temperature exists, the mixing valve and rib heaters must be used. **Failure to do so will cause the lower water collecting trough and sump to plug up with ice to the extent that the water may overflow into the ice storage bin in addition to blocking the water inlet to the pump.** Also, it is advisable to direct air blowers and fans away from the ice flaker as air velocity over the ice flaker will reduce the effectiveness of the heaters.

***** CAUTION *****

<u>NEVER</u> install an ice flaker in a cold room 45°F (7°C) or lower. The ice flaker warranty is void if the ice flaker is installed in a cold room or outside where the ambient temperature may drop below freezing.

***** CAUTION *****

Optimum surrounding air temperature range.....60°F (15°C) to 95°F (35°C)
Minimum air temperature (without heater).....50°F (10°C)
Minimum air temperature (with heater).....45°F (7°C)
Maximum air temperature.....100°F (38°C)
Optimum water temperature range.....60°F (15°C) to 80°F (25°C)
Minimum water temperature (without water mixing valve).....45°F (7°C)
Minimum water temperature (water mixing valve must be used).....36°F (2°C)
Maximum water temperature.....90°F (32°C)

Installation without ice bin

Rapid Freeze Ice Flakers may be installed under certain conditions without a typical ice bin. When the flaker is installed without a bin, it must have a drainable condensate pan located under the machine. The flaker must also be mounted high enough off the floor so there is no chance that somebody may reach into the evaporator from below either with a pole, or their arm, while the flaker is operating.

Refrigerating the ice storage bin is not normally necessary nor is it recommended. However, in those cases where ice is to be discharged into an existing freezer room then, as a minimum, electric heaters should be installed on the bottom casting and the sump regardless of the actual ambient temperature of the air surrounding the ice flaker. Air from the freezer room should be directed away from the ice flaker opening otherwise, the effectiveness of the heaters will be reduced. If the storage area is held at 28°F (-8°C) or colder, it is advisable to install the ice flaker 1 to 2 feet above the freezer and use a duct section to direct the ice into the storage bin.

3 Installing the Rapid Freeze Flaker

Installation on Ice Storage Bins

Rapid Freeze® Ice Flakers are designed to run smoothly and without vibration. The machines are usually mounted directly on top of an insulated ice storage bin. The storage bin must have an insulated top, with a drip pan which is an integral part of the top designed specifically for the Rapid Freeze Ice Flaker model installed on it. The ice bin should be designed to support the weight of the flaker, and the ice stored inside the bin. Most ice storage bins can handle the weight of a 2000, 3000, 4000 or 6000 pound capacity bare ice flaker without any additional bracing. ***It is recommended that the bin manufacturer be consulted before any ice flaker is placed on top of a bin.*** The weight of each ice flaker machine, along with the diameter of the hole required for ice entry into the bin, is given on the specification sheet for that particular model.

Allow for a MINIMUM OF 6" clearance on top of the 2000, 3000, 4000 or 6000 pound capacity, and MINIMUM OF 10" clearance on top of the10,000, 15,000, and 20,000 pound capacity ice flaker for removal of the speed reducer, and sufficient space around the unit (approximately 3 feet) for inspection and service.

Recommended Installation Method on Ice Bin

Refer to bin manufacturer's installation instructions for proper assembly and set up procedures. Locate and set the bin on a solid level footing. Once the bin is set in place and leveled, the Rapid Freeze ice flaker can be placed inside the drip pan.

Exhibit 2 illustrates the forklift and block method of placing the ice flaker on the bin.

Forklift & Block Method

You will Need:

- Forklift truck with adequate load and height capacities
- (8) 2 X 4 wood blocks approximately 6-8" long
- (2) 2 X 4 's approximately 36" long
- Pry Bars

Step 1. Position ice flaker on forks.

Step 2. Stack two wood blocks in each corner of the drip pan on the ice bin.

Step 3. Lift ice flaker over the wood blocks, position ice drop zone over the bin top opening, then set the flaker on the blocks.

Step 4. Remove forklift.

Step 5. Stack the two 36" long 2 X 4's on the side of the bin beside the drip pan, overlapping the front and back of the bin.

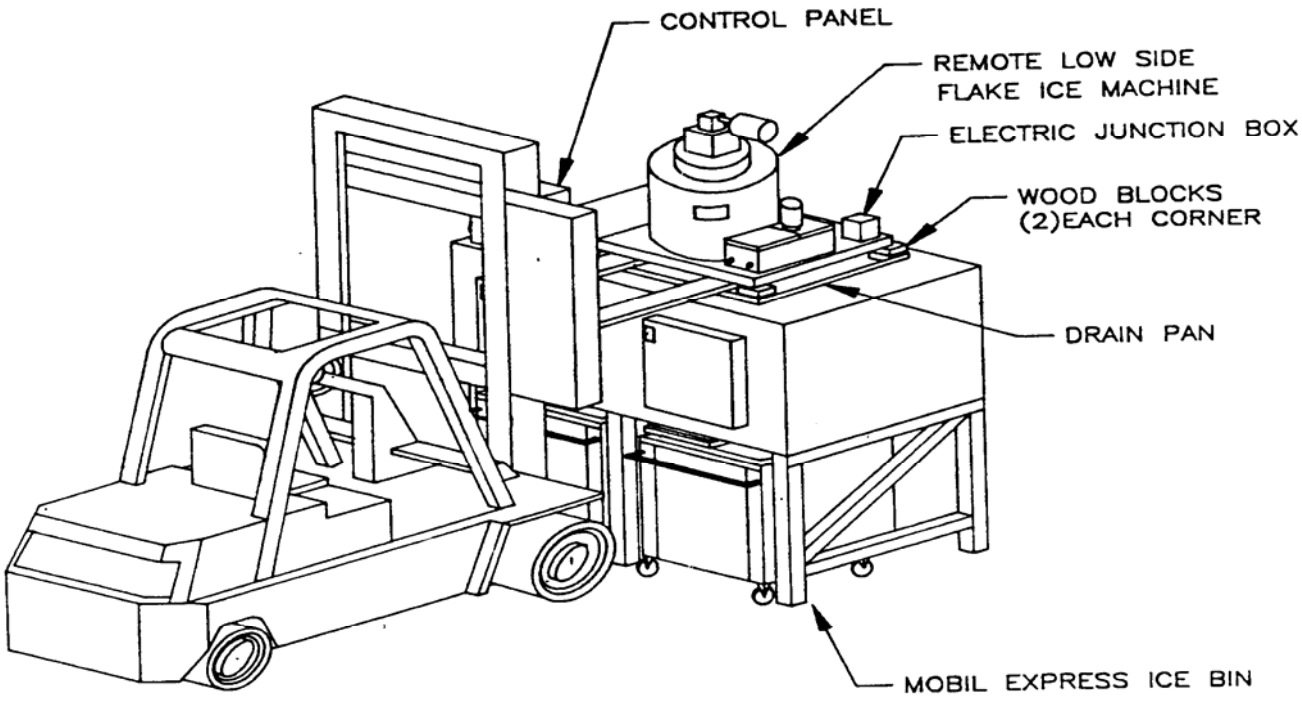
Step 6. Using a pry bar as a lever on the 2 X 4's raise the side of the flaker and remove the **TOP** blocks only.

Step 7. Repeat steps 5 & 6 on the other side.

Step 8. With the flaker sitting on one (1) block under each corner, repeat steps 5, 6 & 7 removing the remaining blocks. Drip pan flanges ***MAY*** bend slightly.

Step 9. Straighten the drip pan flanges (if necessary)

(EXHIBIT 2)



3 Installing the Rapid Freeze Flaker

WATER LINE: Connect a ½" galvanized or ½" ODS COPPER water pipe from the closest convenient water line to within 2 to 4 feet of the ice flaker water sump. Install a water line shutoff valve near the ice flaker. Use copper tubing between water valve & water inlet connection located on water sump.

Refer to the engineering sheet for the line size connection from the ice flaker sump to the water supply line. If water supply has silt or sand in it, a coarse water filter is recommended.

***** IMPORTANT NOTICE *****

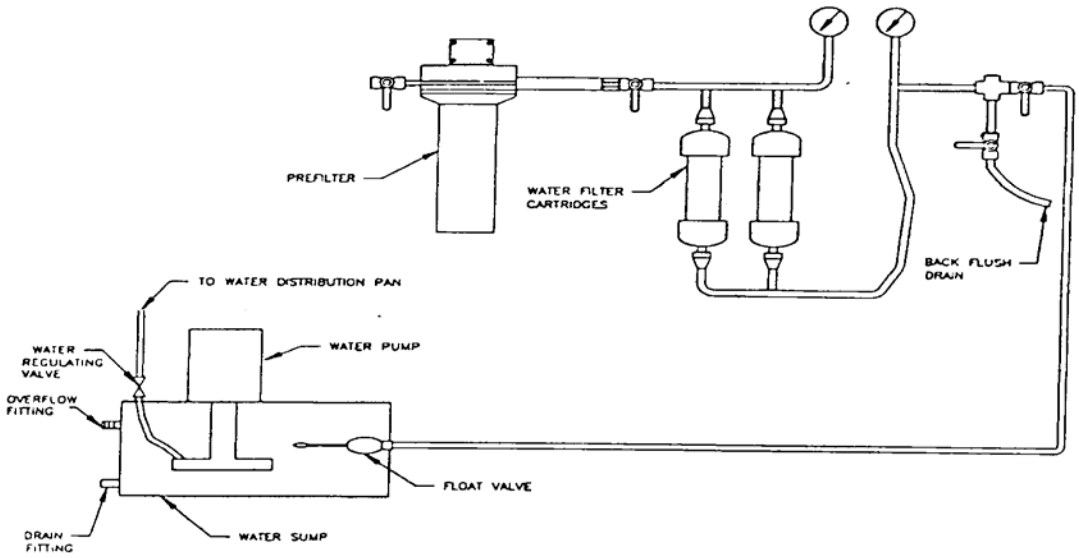
A MINIMUM WATER PRESSURE OF 30 PSIG IS REQUIRED AT THE ICE FLAKER FLOAT VALVE TO INSURE ADEQUATE WATER FLOW.

MAXIMUM WATER PRESSURE TO THE FLOAT VALVE IS 60 PSIG.

***** IMPORTANT NOTICE *****

WATER SUPPLY & FILTER CONNECTIONS

(Exhibit 3)



REFRIGERANT CHARGING

Special Precautions To Be Observed When Charging Refrigeration Systems

Only technically-qualified persons, trained and certified in the handling of refrigerant and operation of refrigeration systems, should perform the operations described in this manual.

If a refrigeration system is being charged from refrigerant cylinders, disconnect each cylinder when empty or when system is fully charged. A gauge should be installed in the charging line to indicate the refrigerant cylinder pressure. The cylinder may be considered empty of liquid R-22 refrigerant when the gauge pressure is 25 psi or less, and there is no frost on the cylinder. Close the refrigerant charging valve and cylinder valve before disconnecting the cylinder. Loosen the union in the refrigerant line, SLOWLY and CAREFULLY, to relieve refrigerant pressure in the charging hose.

***** WARNING *****

Never open charging valve allowing refrigerant to vent directly to atmosphere. Refrigerant must be reclaimed through a recovery system.

***** WARNING *****

Always store cylinders containing refrigerant in a cool place. They should never be exposed to temperatures higher than 125°F (52°C) and should be stored and secured in a manor to prevent abnormal mechanical shocks.

***** CAUTION *****

Service/Installation personnel MUST have knowledge of refrigeration systems to properly charge this ice flaker.

***** CAUTION *****

Verify that thermostatic expansion valve supplied with the ice flaker matches the refrigerant for the refrigeration system or condensing unit.

***** WARNING *****

All Rapid Freeze BARE and Remote model ice flakers are shipped with a small holding charge of dry Nitrogen.

SYSTEM MUST BE EVACUATED PRIOR TO CHARGING REFRIGERANT.

***** WARNING *****

3 Installing the Rapid Freeze Flaker

Follow good accepted practice and procedure to charge refrigerant into the system briefly outlined as follows.

1) Pressurize and test the system checking for leaks.

2) Use a good quality vacuum pump to evacuate the system. Make sure all shut-off valves are **OPEN** so that the entire system is evacuated. Allow vacuum pump to run for several hours.

3) Break vacuum with refrigerant and evacuate again.

4) Repeat step 3. This is called "triple evacuation". It ensures that all air and moisture has been removed from the system. Failure to do so may result in compressor burn-out.

5) After the third evacuation, notice that the "eye" in the liquid indicator is green, (supplied by Howe on all flakers *except* bare flakers) indicating that the system is clean and dry. Then continue to charge the system (using gas not liquid).

Above is a brief outline for charging the system. Consult the rack or condensing unit manufacturer for full details.

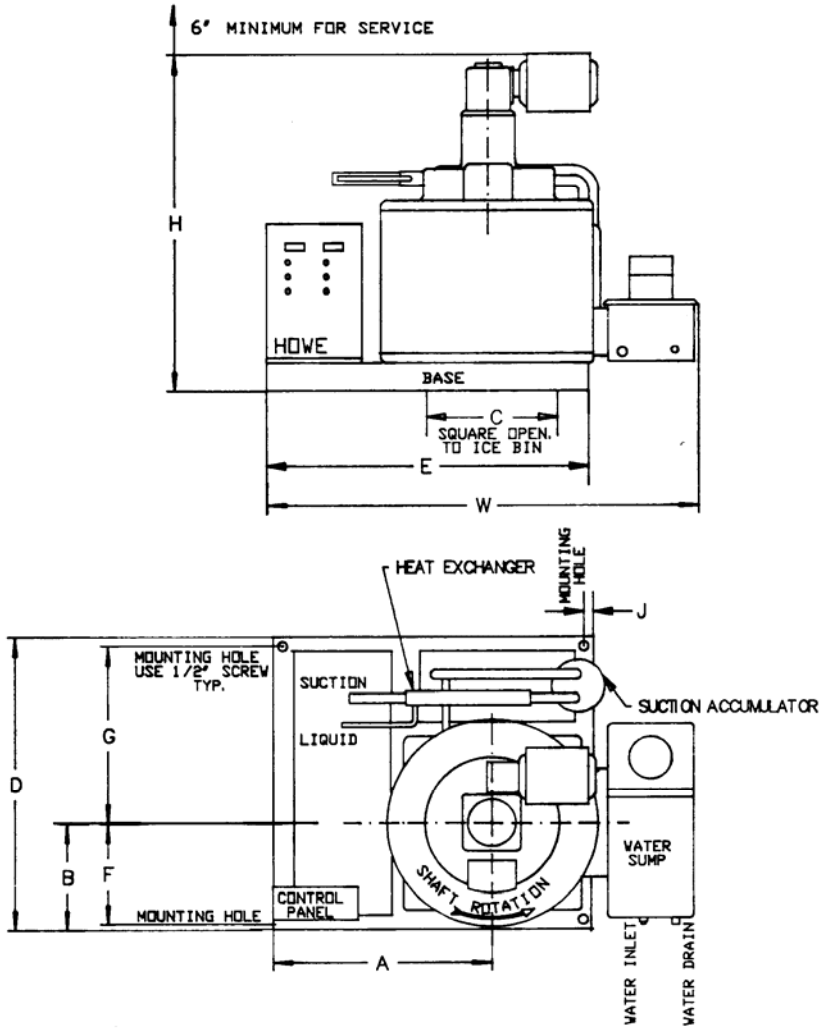
ASSEMBLY DRAWING 11ESS-21ESS

AUGUST 1995
SUPERSEDES SEPT.1992

ILS-44

HOWE CORPORATION

11ES, 16ES, 21ES SEAWATER-LAND BASED
11ESS, 16ESS, 21ESS SEAWATER-SHIPBOARD
REMOTE FREON ICE FLAKERS



MODEL NO.	DIMENSIONS										CONNECTION SIZES			REFRIGERATION REQUIREMENT AT-30°F SUCT. TEMP. 80°F WATER TEMP.
	A	B	C	D	E	F	G	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES										OD			BTU/HR
11ES, 11ESS	23	11	15	32½	33½	10½	19	37	1½	45	1⅛	½	⅜	17,000
16ES, 16ESS	23	11	15	32½	33½	10½	19	41½	1½	45	1⅜	⅝	⅜	25,500
21ES, 21ESS	24¼	13¼	19	35	37	12½	21	46	1½	49	1⅜	⅝	⅜	34,000

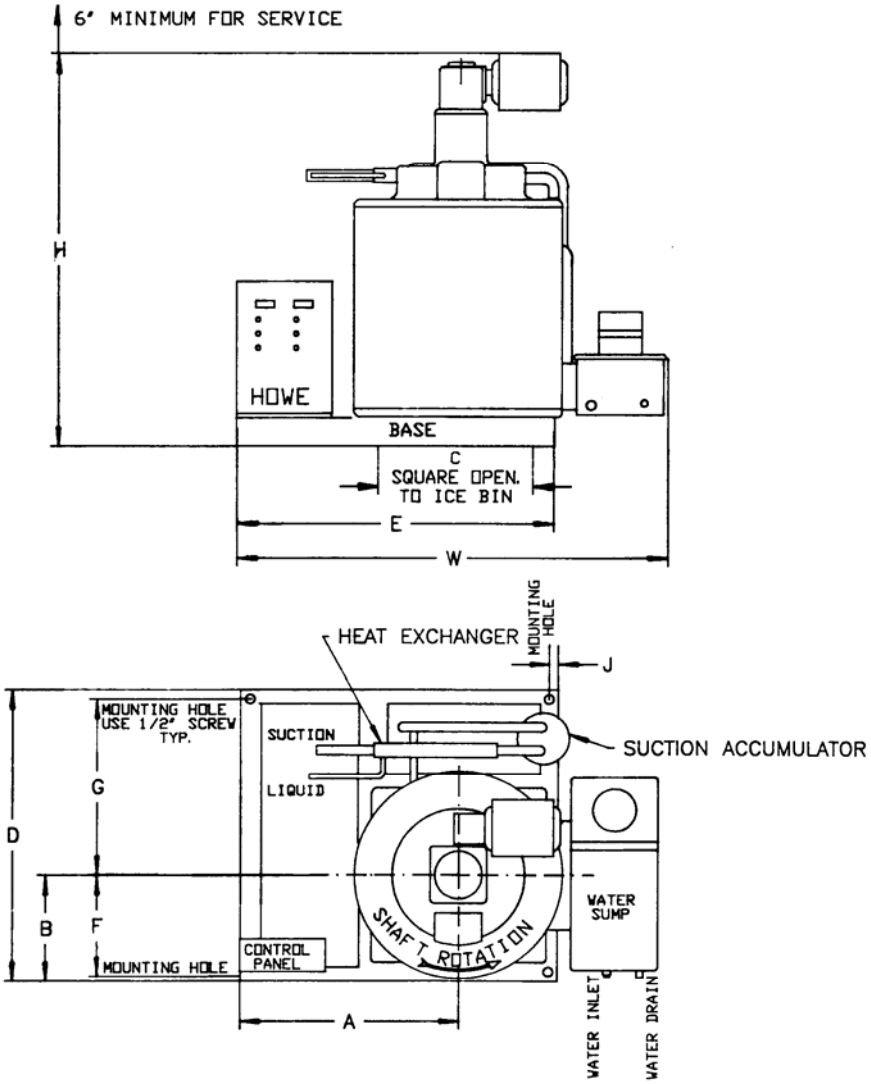
ASSEMBLY DRAWING 31ES-31ESS

AUGUST 1995
SUPERSEDES OCT.1992

ILS-45

HOWE CORPORATION

31 ES SEAWATER-LAND BASED
31 ESS SEAWATER-SHIPBOARD
REMOTE FREON ICE FLAKERS



MODEL NO.	DIMENSIONS										CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -30°F SUCT. TEMP. 80°F WATER TEMP.
	A	B	C	D	E	F	G	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES										OD			BTU/HR
31 ES, 31 ESS	24 1/4	13 1/4	19	35	37	12 1/2	21	53	1 1/2	48	1 5/8	7/8	3/8	51,000

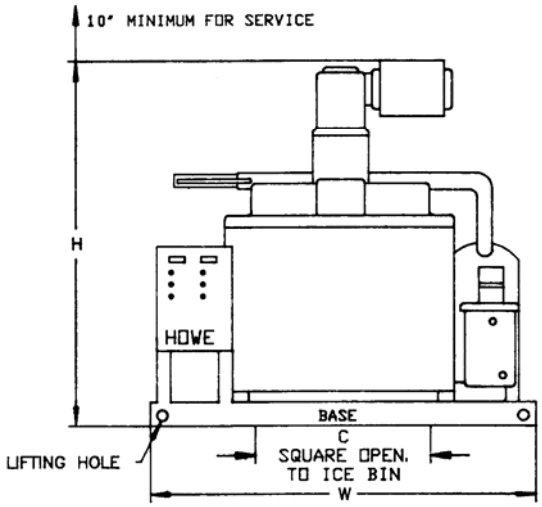
ASSEMBLY DRAWING 51ES-51ESS

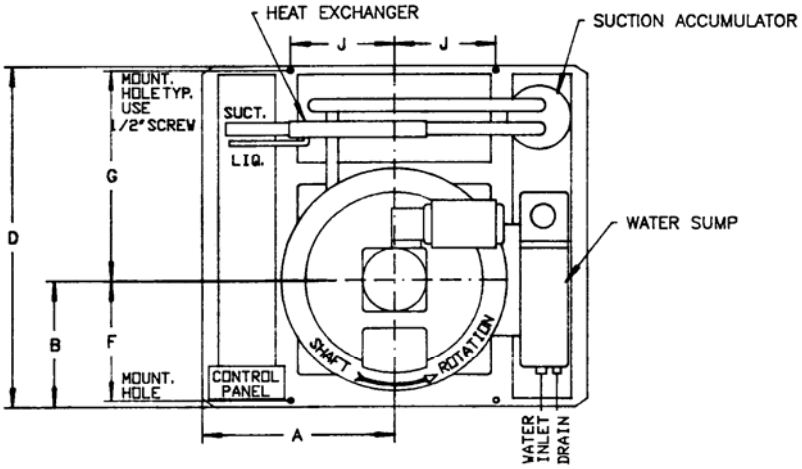
AUGUST 1995
SUPERSEDES OCT.1992

ILS-79

HOWE CORPORATION

51ES SEAWATER-LAND BASED
51ESS SEAWATER-SHIPBOARD
REMOTE FREON ICE FLAKERS





MODEL NO.	DIMENSIONS									CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -30°F SUCT. TEMP. 80°F WATER TEMP.
	A	B	C	D	F	G	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES									INCHES			BTU/HR
51ES, 51ESS	35	22	30	60	20 1/2	37 1/2	62	18	68	2 1/8	7/8	1/2	85,000

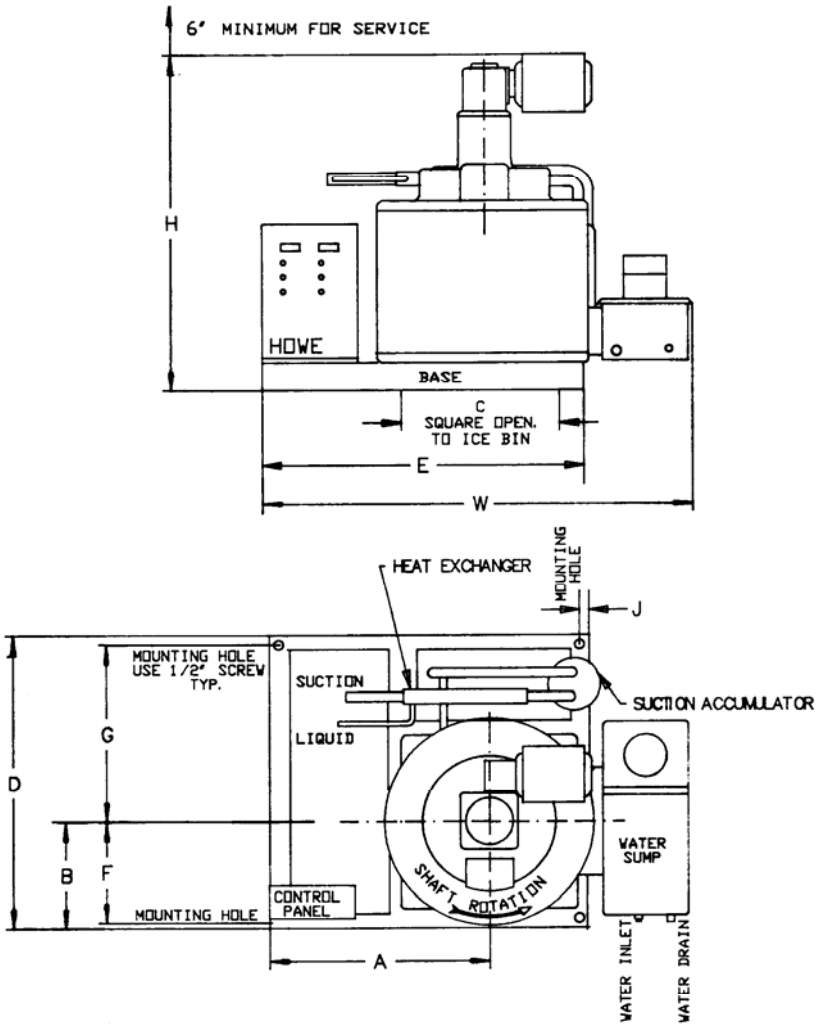
ASSEMBLY DRAWING 11EFS-21EFS

AUGUST 1995
SUPERSEDES DEC.1992

ILS-97

HOWE CORPORATION

11EFS, 16EFS, 21EFS FRESH WATER-SHIPBOARD REMOTE FREON ICE FLAKERS



MODEL NO.	DIMENSIONS										CONNECTION SIZES			REFRIGERATION REQUIREMENT AT-5°F SUCT. TEMP. 80°F WATER TEMP.
	A	B	C	D	E	F	G	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES										OD			BTU/HR
11EFS	23	11	15	32½	33½	10½	19	37	1½	45	1⅛	½	⅜	18,000
16EFS	23	11	15	32½	33½	10½	19	41½	1½	45	1⅜	⅝	⅜	27,000
21EFS	24¼	13¼	19	35	37	12½	21	46	1½	49	1⅜	⅝	⅜	36,000

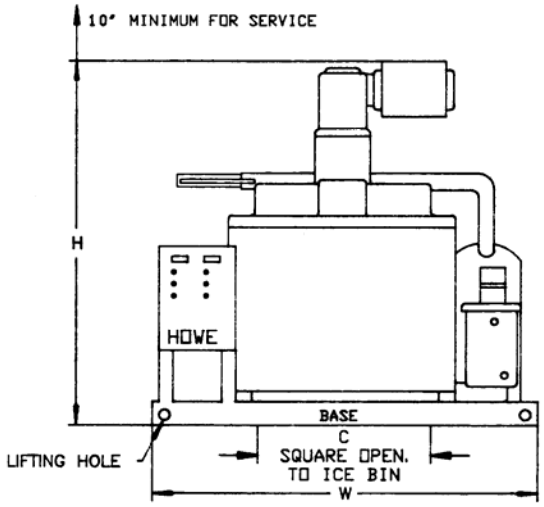
ASSEMBLY DRAWING 51EFS

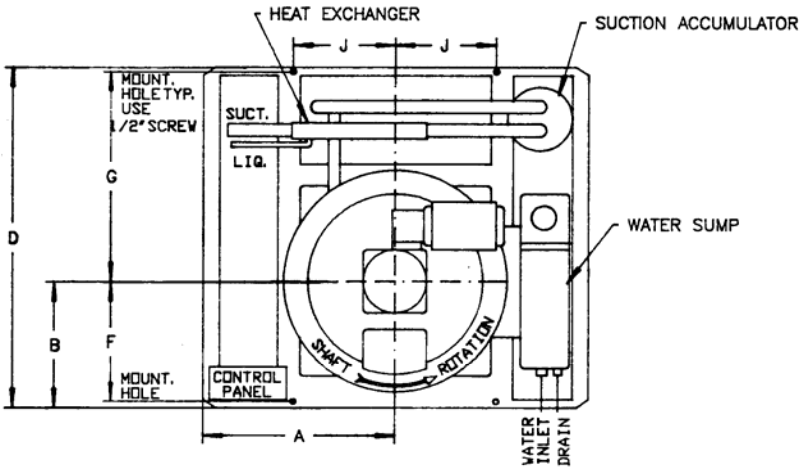
AUGUST 1995
SUPERSEDES DEC.1992

ILS-99

HOWE CORPORATION

51EFS FRESH WATER SHIPBOARD REMOTE FREON ICE FLAKERS





MODEL NO.	DIMENSIONS									CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -5°F SUCT. TEMP. 80°F WATER TEMP.
	A	B	C	D	F	G	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES									INCHES			BTU/HR
51EFS	35	22	30	60	20 1/2	37 1/2	62	18	68	2 1/8	7/8	1/2	90,000

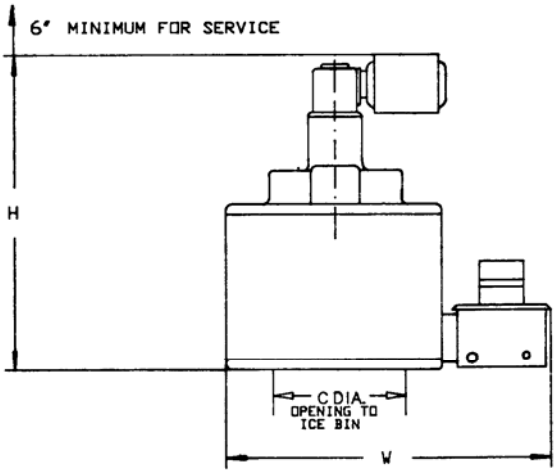
ASSEMBLY DRAWING 10ESS-20ESS

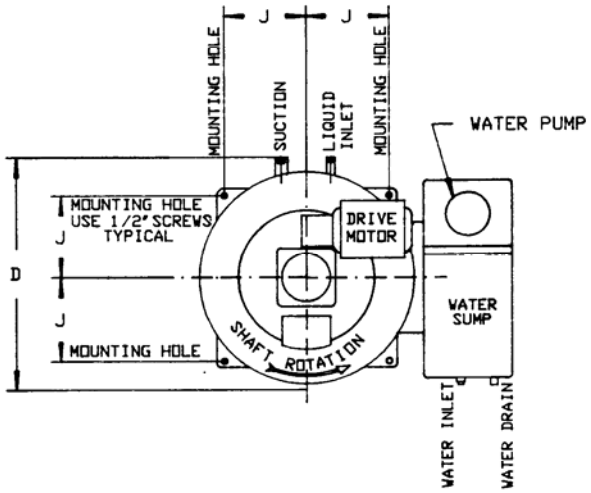
AUGUST 1995
SUPERSEDES SEPT.1992

ILS-55

HOWE CORPORATION

10ES, 15ES, 20ES SEAWATER-LAND BASED
10ESS,15ESS,20ESS SEAWATER-SHIP BOARD
BARE FREON ICE FLAKERS





MODEL NO.	DIMENSIONS					CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -30°F SUCT. TEMP. 80°F WATER TEMP.
	C	D	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES					MPT	MPT	OD	BTU/HR
10ES, 10ESS	14	23	34	8 1/2	32 1/2	1	3/8	3/8	17,000
15ES, 15ESS	14	23	38 1/2	8 1/2	32 1/2	1 1/4	1/2	3/8	25,500
20ES, 20ESS	18	27 1/2	43	10 1/4	36 1/2	1 1/4	1/2	3/8	34,000

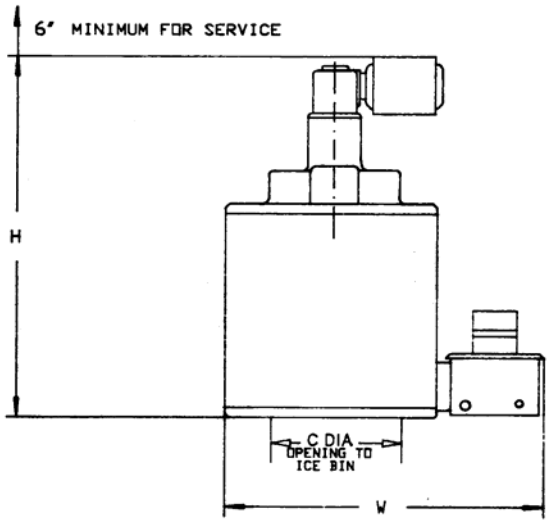
ASSEMBLY DRAWING 30ES - 30ESS

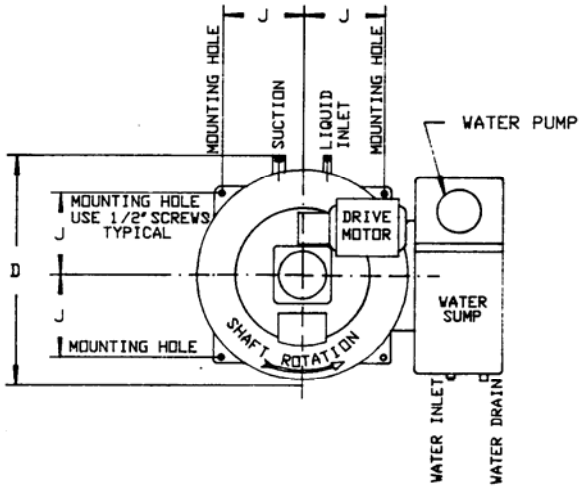
AUGUST 1995
SUPERSEDES SEPT.1992

ILS-56

HOWE CORPORATION

30ES SEAWATER-LAND BASED
30ESS SEAWATER-SHIP BOARD
BARE FREON ICE FLAKERS





MODEL NO.	DIMENSIONS					CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -30°F SUCT. TEMP. 80°F WATER TEMP.
	C	D	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES					MPT	MPT	OD	BTU/HR
30ES, 30ESS	18	27½	50	10¼	36½	1½	½	⅜	51,000

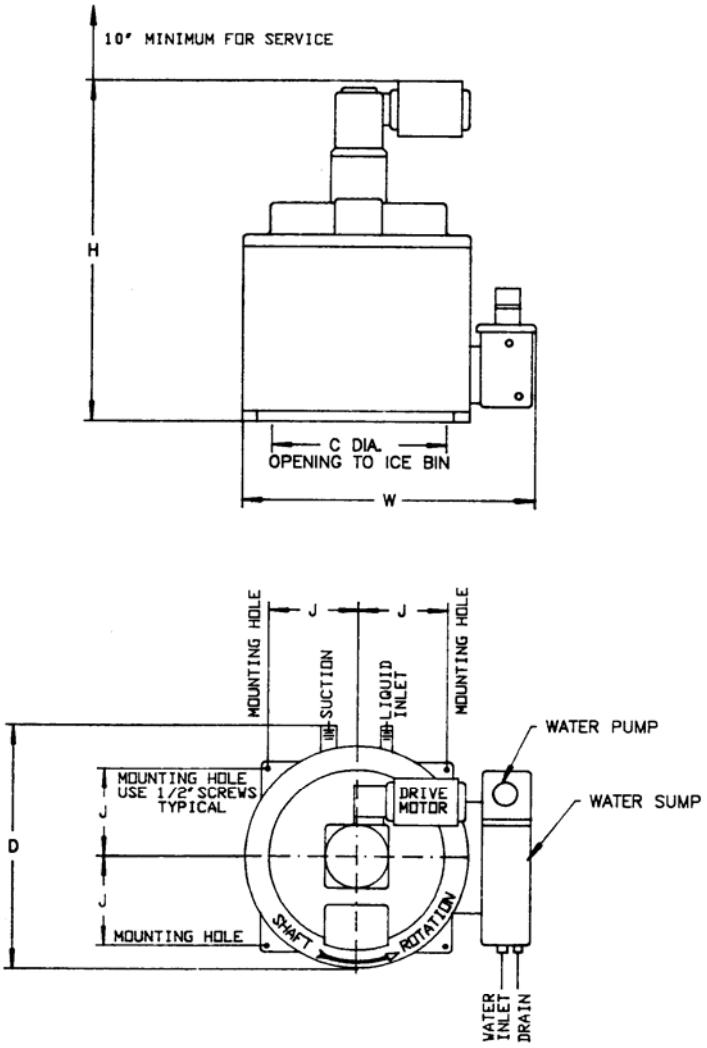
ASSEMBLY DRAWING 50ES -50ESS

AUGUST 1995
SUPERSEDES SEPT.1992

ILS-58

HOWE CORPORATION

50ES SEAWATER-LAND BASED
50ESS SEAWATER-SHIPBOARD
BARE FREON ICE FLAKERS



MODEL NO.	DIMENSIONS					CONNECTION SIZES			REFRIGERATION REQUIREMENT AT -30°F SUCT. TEMP. 80°F WATER TEMP.
	C	D	H	J	W	SUCTION TO COMPR.	LIQUID	WATER INLET	
	INCHES					MPT	MPT	OD	BTU/HR
50ESS, 50ES	30	42	58	16 1/4	53 1/2	2	3/4	1/2	85,000

6 SEAWATER MODEL INSTALLATION

WIRING & ELECTRICAL CONNECTIONS

***** CAUTION *****

ELECTRICAL WIRING SHOULD BE PERFORMED BY QUALIFIED TECHNICIANS FOLLOWING LOCAL ELECTRICAL CODES.

***** CAUTION *****

All internal wiring on the remote model seawater ice flakers between the control panel and components are pre-wired at the factory. Wiring between the remote ice flaker and remote condensing unit is not factory wired, and will need to be wired in the field.

1 Install disconnect (not supplied by factory) and connect to terminals L_1 & L_2 in the flaker control panel.

2 Install a remote on-off switch (optional) and wire to the ice flaker panel terminals marked ON-OFF SWITCH as shown. Remove wire jumper before wiring switch.

3 When connecting to dedicated condensing unit, wire CR3 relay in condensing unit control panel with a normally open contact wired back to the flaker panel between terminal Line "A" and terminal Line "B" (See electrical diagram for exact wiring). When connecting to a central refrigeration system, a wire jumper is installed between Line "A" & Line "B". The reason for the CR3 relay is to allow the solenoid valve to de-energize when the compressor safeties open, preventing liquid migration back to the compressor suction while the compressor is off on a safety switch.

4 Automatic Ice level control must be installed to prevent ice from building up into the flaker barrel and possibly damaging the machine. Refer to Icel level mounting & installation instructions in section 8,

FREON PIPING

FREON PIPING LINE SIZES
(TABLE 4)

	50 FOOT RUN		APPRX. REFRIGERANT CHARGE
	LIQUID	SUCTION	
11ES, 11ESS	1⅛	½	8
16ES, 16ESS	1⅜	⅝	13
21ES, 21ESS	1⅜	⅝	17
31ES, 31ESS	1⅝	⅞	28

6 SEAWATER MODEL INSTALLATION

***** IMPORTANT NOTICE *****

When piping ice flaker to a central refrigeration rack, liquid line must be connected to the receiver side of any defrost solenoid/control valve to insure uninterrupted liquid feed/supply during normal defrost cycles of the rack.

*** IMPORTANT NOTICE ***

When installing a seawater ice flaker, it is important that the flaker is properly piped as shown on the piping schematic on page 26. On the liquid line, install a filter/drier (not supplied).

When connecting to a dedicated oversized condensing unit or refrigeration rack system, an EPR valve must also be provided and installed to regulate the evaporator suction temperature to between -35°F and -30°F (-37.1°C to -34.3°C)

Liquid Line: For longer runs, good refrigeration practice dictates that the liquid line be one size larger to prevent flashing due to excessive pressure drop. If the system is fully charged, the presence of bubbles in the sight glass at the ice flaker is a visible indication that flashing is occurring. It may not be possible to adjust the thermostatic expansion valve properly when this condition exists. Note - Flashing may also occur if the liquid line is run through hot areas of the vessel, such as boiler rooms or smoke rooms. If this is the case, the liquid line should be insulated.

***** IMPORTANT NOTICE *****

When connecting to a low temperature rack (below -35°F –37.1°C) you must provide and install a suction pressure regulator (EPR Valve) to control suction pressure at the ice flaker at approximately -30°F(-34.3°C).

***** IMPORTANT NOTICE *****

Suction Line: For longer than 50 foot run, the next size suction line may be used for horizontal runs and slightly pitched towards the compressor rack. Vertical risers should be the same size as the ice flaker connection size to maintain proper velocity for oil return. If the vertical riser is more than 10 feet, it is necessary to install a P-trap at the bottom of the riser. Install an additional trap for each 15ft of riser to facilitate oil lift. Suction line should always be insulated.

Suction and Liquid lines should always be supported and secured to avoid damage and or refrigeration leaks.

ELECTRIC EYE ICE LEVEL CONTROL

Electric Eye Ice Level Control

The use of a suitable ice level control to shut off the ice flaker when the bin fills up is mandatory. Failure to use the proper ice level control will cause ice to build up within the ice flaker evaporator after the bin is full to capacity. Operating the flaker with a full bin will cause the ice deflector to bend or break as it "churns" the ice. In extreme cases it may result in damage to the speed reducer and/or the electric drive motor and flexible coupling.

The proper and approved bin level control is the photo-electric eye. When ordered with the machine, the eyes are mounted on brackets that will attach to the bin top or wall. The cables are routed through the bottom casting of the ice flaker. The power module is mounted inside the ice flaker control panel.

ELECTRIC EYE ICE LEVEL CONTROL
(EXHIBIT 23)

8 Accessories

WHY ICE BIN THERMOSTATS ARE NOT USED.

The use of a bin thermostat is not recommended and not permitted. The Rapid freeze ice flaker is designed so that the freezing drum (operating @ -5°F to -10°F) is located directly over the ice drop opening in the bin. This large opening permits cold air to cascade off the evaporator down into the bin. Since the air temperature in the bin is equal to or lower than the ice temperature, the set point of the thermostat cannot be adjusted to where it can reliably distinguish temperature difference upon contact with ice.

In most cases when deflector damage is reported, investigation has shown that a thermostat was used as a bin level control device. The photo eye ice level control physically sense the presence of ice rather than sensing temperature.

RIB HEATING ELEMENTS

When rib heaters are necessary

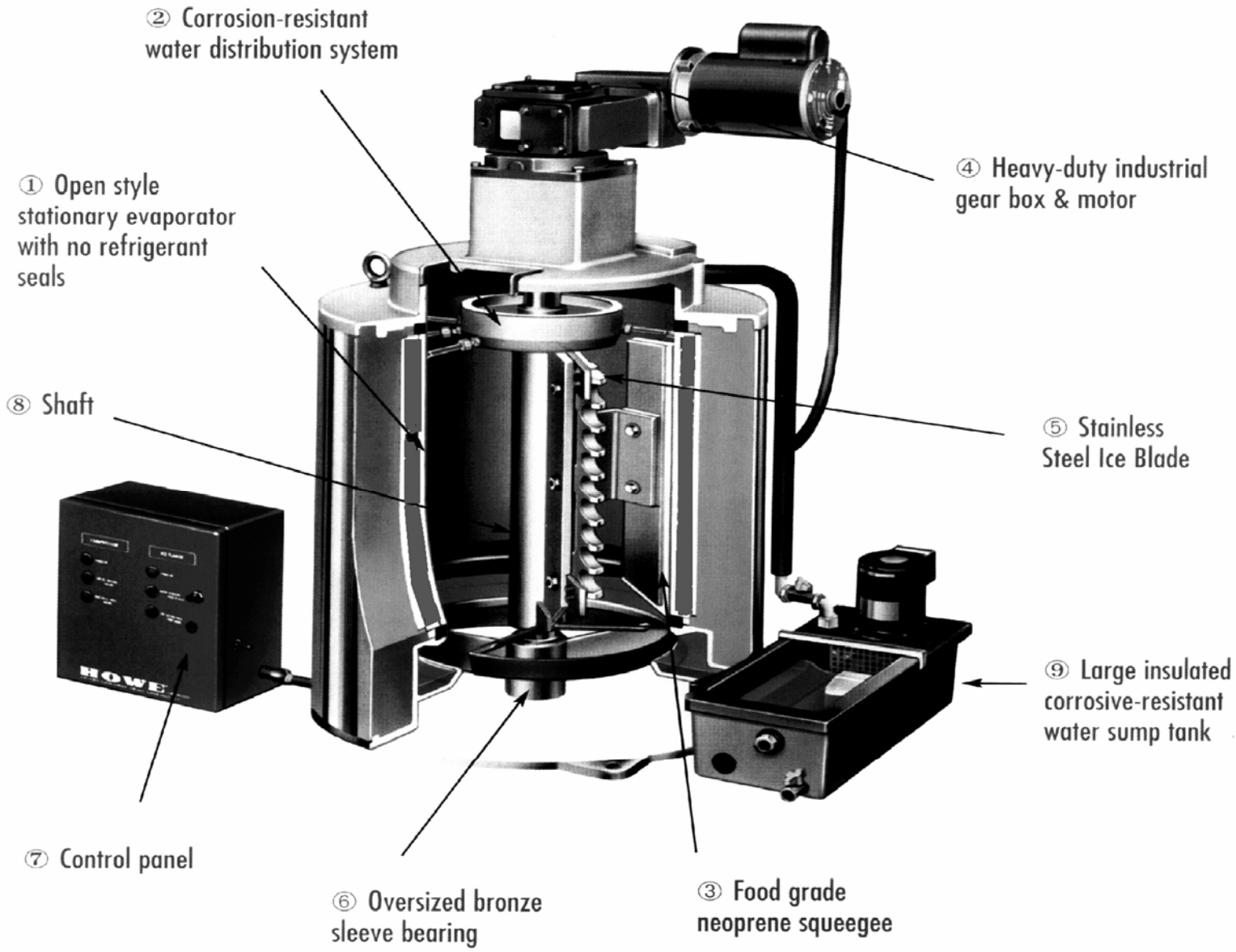
Rapid Freeze ice flakers are designed to operate in ambient temperatures between 50°F (10°C) and 100°F (38°C). When operating in ambient temperatures between 50°F (10°C) and 45°F (7°C), rib heaters MUST be installed on the ice flaker. Under NO circumstances is the machine to be allowed to operate in ambient conditions under 45°F(7°C).

Factory installed
Factory installed rib heaters are available on all sizes and configurations when ordered with the ice machine. These heaters are installed inside the three ribs on the bottom casting, inside the evaporator section of the ice flaker. If the heaters are not ordered with the machine, they cannot be installed inside the ribs.

Field Installed
Large capacity models 50, 51, 75, 76, 100, & 101 E, EA & EAR can have rib heaters installed in the field. Remove the 3 red plastic caps from the outer jacket near the bottom of the flaker. Install a close nipple into each threaded hole and attach a bell box to each nipple. Insert the rib heater into the rib cavity through the bell box and nipple. Wire the three heaters in parallel so they are energized when the machine is making ice. (See wiring diagram)

9 How The Rapid Freeze Flaker Operates

ICE FLAKER CUTAWAY DRAWING
(EXHIBIT 26)


② Corrosion-resistant water distribution system
① Open style stationary evaporator with no refrigerant seals
④ Heavy-duty industrial gear box & motor
⑧ Shaft
⑤ Stainless Steel Ice Blade
⑨ Large insulated corrosive-resistant water sump tank
⑦ Control panel
⑥ Oversized bronze sleeve bearing
③ Food grade neoprene squeegee
HOWE

THE INSIDE STORY

1) **The cut away picture from the previous page will allow you to locate the position of the parts as well as showing that Rapid Freeze® Flakers are an open vertical stationary "barrel" style evaporator. Each evaporator is an all welded, one piece design which provides superior structural integrity and heat transfer characteristics. The heavy duty construction accounts for a 25 year life time evaporator warranty. The barrel style evaporator allows the ice to fall through the center of the evaporator and avoids extruding the ice to the top like commercial flakers. This design eliminates the bearing loads created by extruding ice which accounts for the short life of commercial flakers and high maintenance.**

2) **The ice blade is made of investment cast stainless material. The investment casting process assures that razor thin tolerances can be maintained indefinitely. Stainless steel is corrosion resistant which is important particularly in areas with poor water quality. The ice blade never comes into contact with the evaporator, which accounts for its long life. Since the blade was introduced in 1986 The factory has rarely sharpened or replaced a stainless steel blade.**

3) **The rubber squeegee is constructed of a USDA approved material which is resilient enough to provide years of service without replacement. It assures that 100% of the daily ice production is completely dry, crisp flake ice which contains more than 144 BTUs per pound of ice because it is sub-cooled. This is an important feature when comparing Rapid Freeze® to a commercial flaker, because none of the commercial units use a squeegee. As a result 20-30% of the daily ice production in a commercial flaker is water which runs down the drain.**

4) **The bronze bearing and shaft thrust washer included are impregnated with a lubricating oil, grease fittings are also provided. The bearings are oversized to provide a lower level of friction on the interior surface. This assures a very long life and substantially lower maintenance cost compared to commercial flakers.**

5) **The advantage of Rapid Freeze flake ice offers over the "granular" ice produced on commercial machines is the greater surface area, dryness, lower temperature and longer life. Rapid Freeze flake ice contains over 17,000 sq. ft. of surface area per ton. This equates to approximately 2 times the surface area of "granular" ice. Greater surface area provides more contact with the product to assure better cooling. The temperature of Rapid Freeze flake ice measures approximately 22°F when harvested. This sub cooled ice contains more than 144 BTUs per pound which assures a substantially longer life than "granular" ice.**

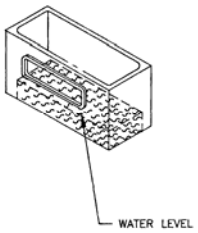
Start & Adjust

Once installation has been completed, and the ice Flaker has been properly evacuated, and charged with the Refrigerant identified on the ice Flaker label, you may proceed with the check and adjust section. The following checklist is provided as a reference of start-up check out procedure, This check list assumes the use of the Howe electronic control panel.

Checklist

1)_____ Before power is turned on, open inlet water valve, (field supplied & installed near the back of the Ice Flaker), and check water level in sump. The water level should be just below the return trough. (see below)

(EXHIBIT 27)



2)_____ Make sure the On-Off switch is in the Off position, then turn on the main disconnect.

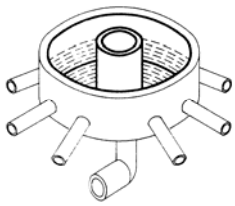
3)_____ Check voltage between line 1 and line 2, verify that it is within nameplate ratings.

4)_____ Turn the On-Off switch ON. Solenoid valve will click loudly, and motor & pump will start .

5)_____ As the drive motor & water pump are energized, water is delivered to the distribution pan located inside the evaporator.

6)_____ Looking down inside the evaporator through the hand hole access cover, verify that the distribution pan water level is maintained at the half full point. If it is too low then the water regulating valve needs to be opened slightly. If the water level is too high, then the regulating valve must be closed accordingly. Continue opening or closing the adjustment valve until the water level is maintained at the proper level. (see below)

(EXHIBIT 28)



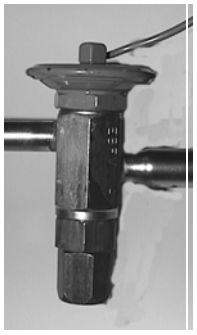
7)_____ After a few minutes, the ice maker will begin to freeze the water circulating over the evaporator into ice.

8)_____ Allow 10-15 minutes to let the ice flaker come down to temperature and balance out.

9)_____ Looking down into the evaporator, through the hand hole cover, check to make sure the ice is being frozen and harvested over the entire surface of the evaporator. If it is not,
9a)_____ check for bubbles in the sight glass.
9b)_____ check the suction pressure @ the ice machine (connect low pressure gauge to a charging valve mounted on the suction line). Suction temperature must be maintained @ -5°F(-20.5°C) to -10°F (-23.3°C) at all times. (For freshwater), -30°F (-34.4°C) (For seawater).
10)_____ Liquid line must have unrestricted flow at all times for proper performance of ice flaker. On ice flakers connected to a rack system, liquid line should be connected directly to the receiver, before any defrost restricting valves.

11)_____ If suction temperature is between -5°F (-20.5°C) to -10°F (-23.3°C), (For freshwater), -30°F (-34.4°C) (For seawater).
and there are no bubbles in the sight glass, and ice is not being frozen and harvested on the entire surface of the evaporator, then the expansion valve must be adjusted.

(EXHIBIT 29)



12)_____ Remove the adjustment stem cover and turn the adjustment stem 1/8 to 1/4 turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve if the evaporator was not freezing ice on its entire length.) Wait 10-15 minutes between each adjustment to allow the valve and machine balance out. Repeat this step until ice is produced and harvested all the way down to the bottom of the evaporator.

13)_____ When the ice maker is adjusted and operating properly, turn off the on-off switch, or block the electric eye beam path. (The electric eye control has a 15 second delay before it's output opens.). When the output opens, or when the on-off switch is opened the shutdown sequence (de-energize the solenoid valve, and start the off delay cycle for the drive motor & water pump.) is initiated.

13a)_____On ice flakers with the solenoid valve interlocked with the condensing unit, the compressor will pump down and cycle off once the compressor reaches the low pressure switch cut-out point.

14)_____ Ice flaker is pumped down, (Solenoid valve is de-energized) drive motor & water pump continue to run until the off delay cycle opens. Field Adjustable between 1-30 minutes, normally set at approximately 5-10 minutes.

15)_____ Electronic overload set point is factory set to trip within seconds when the motor reaches an overloaded condition.

16)_____ Ice maker is adjusted and producing dry, flakes of ice.

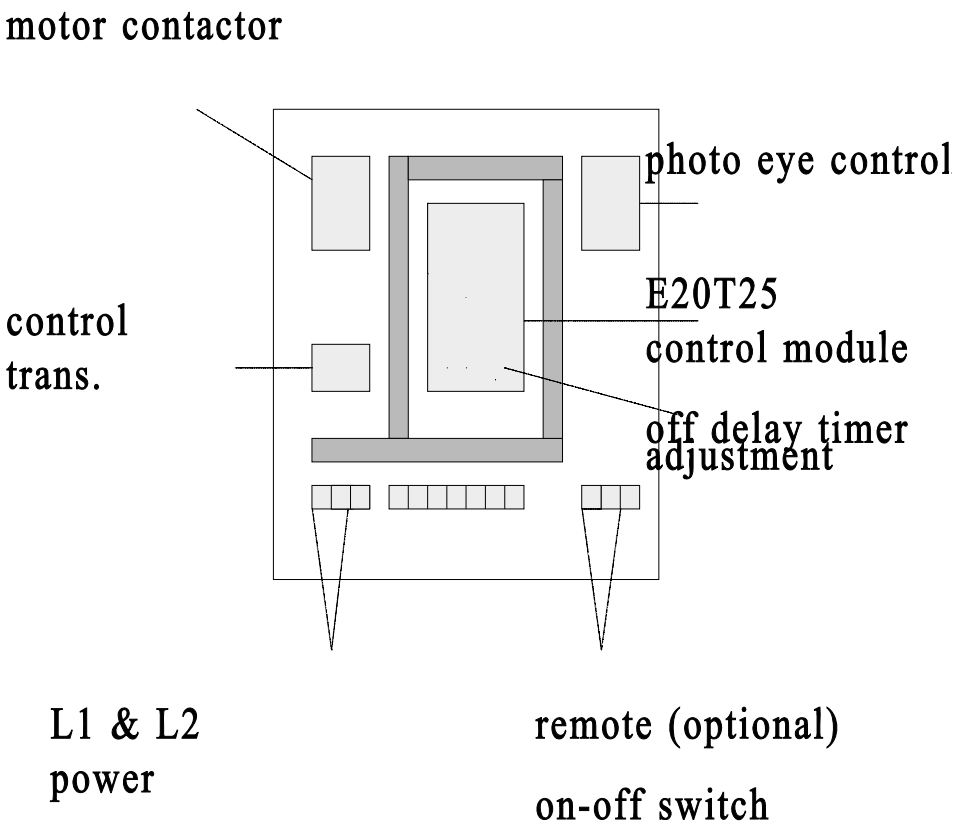
17)_____ Water is NOT dripping into the bin. If it is, locate the dripping point and correct it. (i.e.: distribution pan overflowing, water recovery trough overflowing, or distribution tubes broken or misaligned.)

11 Electric Control Panel

THIS SECTION APPLIES ONLY TO CONTROL PANELS SUPPLIED BY HOWE, ORDERED AS AN OPTION WITH THE MACHINES (Bare Machines).

Components & functions

Panel Layout



1) Motor Contactor
Provides power to the drive motor & water pump. Energized during freezing and pump down cycle, then timed off for shut down. Auxiliary contact provides power to the liquid solenoid valve when contactor is energized.

2) Control Transformer
Provides 24 Volt control power to control panel components, Control module, motor contactor, and indicating lights.

3) Control Module (E20T48)
Main control processor, incorporates motor overload, operating circuit, off- delay circuit. Controls motor contactor and solenoid valve power.

4) Photo Eye power Module
processes signals from electronic eye level control, has built in time delays. Shuts machine off when

ice bin is full to prevent damage to the flaker from ice backing up into the evaporator section.

5) L1 L2 L3 Terminals
Main power terminals for field wiring electric power to control panel. Single phase units (standard) wired to L1 & L2. Three phase units (special) wired to L1 L2 & L3

6) T1 T2 T3 Terminals
Terminals for field wiring (RL model) or factory wiring (RC, SCA & SCW models) drive motor and water pump wires. Single phase units (standard) wired to T1 & T2.

7) Solenoid Valve Terminals
Terminals for field wiring liquid line solenoid valve wires.

8) Line "A" & "B" Terminals
Terminal for providing line 2 power to solenoid valve. On RC, SCA & SCW models wired through compressor safety switches, (high discharge pressure, & high oil pressure) to assure liquid solenoid valve will de-energize if the compressor shuts down on a safety failure. (When connected to a refrigeration rack, a wire jumper is placed between line "A" and line "B" in the flaker control panel.

9) On-Off Switch Terminals
Terminals for installing a remote on-off switch or auxiliary control such as a 7-day clock timer, or remote modem for grocery store applications. (These auxiliary controls will be wired in series with the panel mounted on-off switch, and factory wired photo eye ice level control, so all 3 switches must be closed to start the machine, but opening ANY switch will shut the machine off.

10) Ground Terminal
Terminal for grounding ice machine and control panel to proper ground. Wire per local code requirements.

DOOR MOUNTED ITEMS

1) On-Off Switch
Main on-off switch for control circuit. Wired in series with remote (Optional) field installed switch and Photo Eye Ice level control.

2) Ice Flaker Run light.
Green light is on whenever the contactor and drive motor is energized.

3) Motor Overload Light
Amber light is on whenever the electronic overload opens, to stop the drive motor & pump.

4) Overload reset button.
Normally open reset button, resets overload circuit following overload condition.

Following items are on RC, SCA & SCW panels only:

1) Compressor Run Light.
Green indicating light is on when the compressor contactor is energized.

2) Low Oil Pressure Failure light.

Red Indicating light is on when low oil pressure switch opens shutting down the compressor. Light will stay on until pressure switch is manually reset.

3) High Discharge Pressure Light

Red indicating light is on when high discharge pressure switch opens shutting down the compressor. Light will stay on until pressure switch is manually reset.

4) Low Suction Pump down light.

Amber indicating light is on when ice flaker is off and low pressure switch is open to pump down and shut off the compressor.

E20T48 CONTROL MODULE

The E20T48 control module is the main processor for the ice flaker control panel. It incorporates the timer functions, control relay functions, and overload relay functions

Terminals 1 & 2 :

24 VAC input power.

Terminal 3 :

Ice Flaker Run input signal (all on-off switches, ice level controls and any special controls installed must be in this circuit.)

Terminal 4 :

Overload reset input (Normally Open, momentary contact)

Terminal 5 :

Motor Overload Output (for overload indicating light) energized upon overload condition, stays on until overload is manually reset. Red LED on control module indicates overload condition. This LED will glow prior to actual shut-down of drive contactor.

Terminal 6 :

Ice flaker contactor output (Output is energized when input signal is present & control is not in overload condition.)

When input signal is removed (switch or ice level control open) timer circuit is started. Output will stay energized until timing circuit releases output.

Output is de-energized immediately upon overload condition

Terminals 7 & 8 :

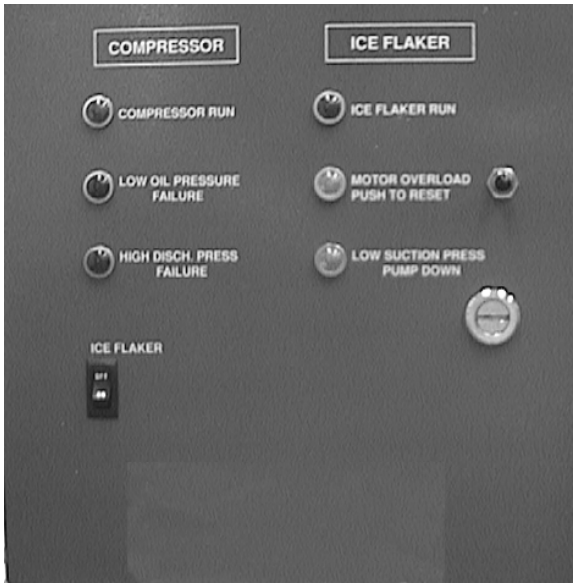
Isolated output contacts for liquid solenoid valve (normally Open) .

Contacts close immediately upon input signal (#3), stay closed until input # 3 signal is removed. Contacts open when input signal (#3) is removed, or when overload condition exists.

11 Electric Control Panel

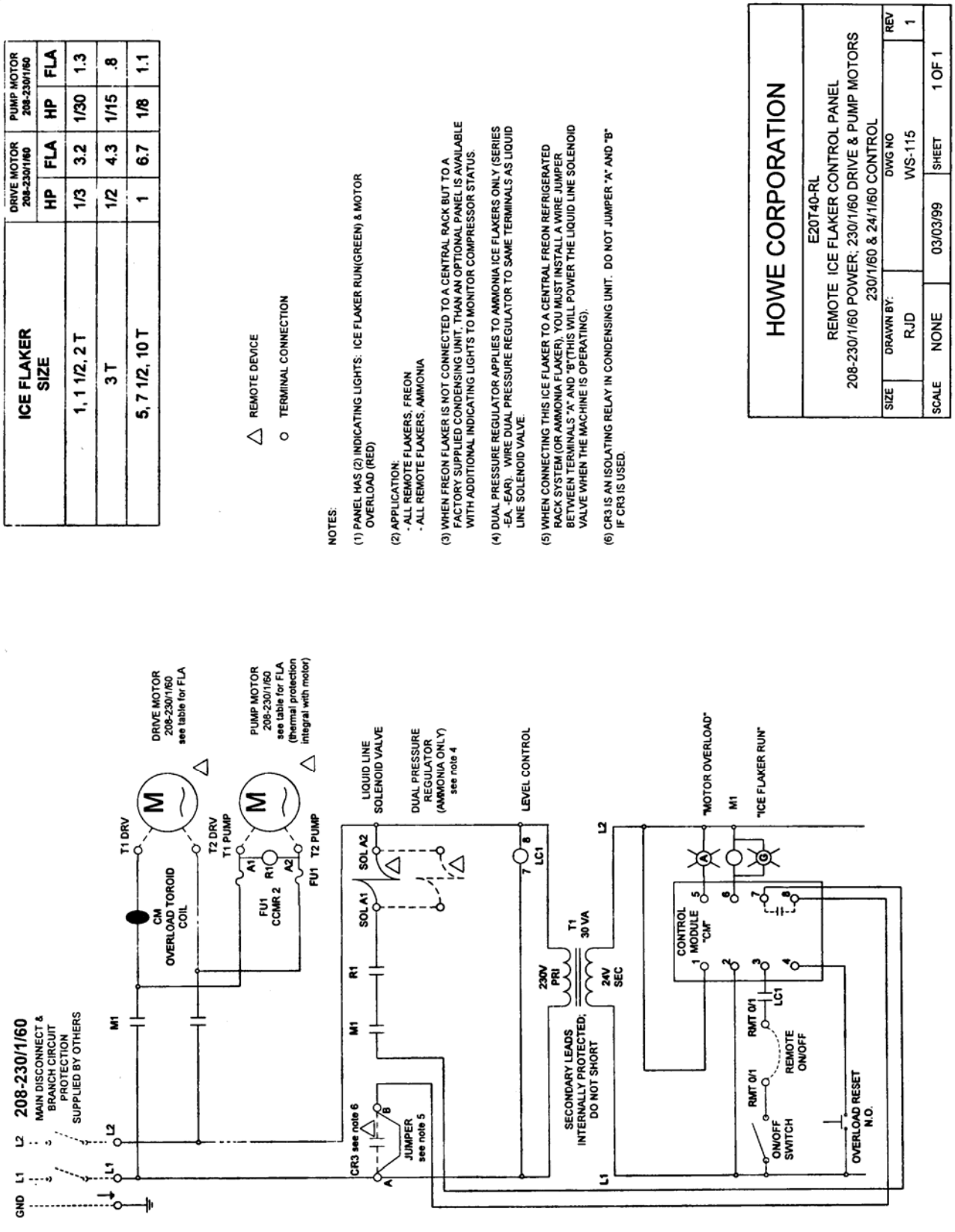
Control panel door layout (E20T40-RL)
(Exhibit 31)

Control Panel Door Layout (E20T40-SCA)



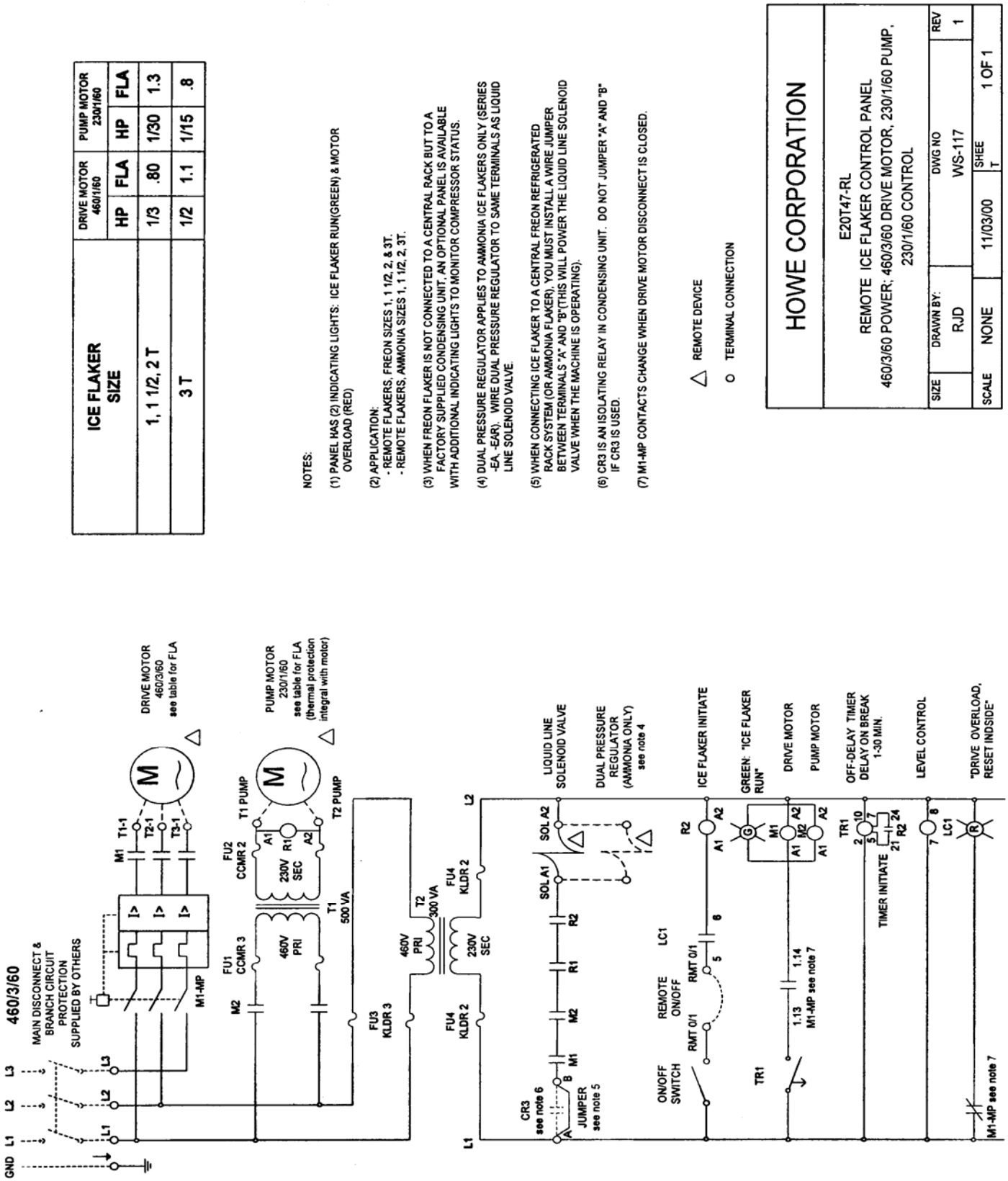
12 Control Panel Wiring Diagrams

Control Panel Schematic (E20T40-RL)


ICE FLAKER SIZE
DRIVE MOTOR 208-230/1/60
HP
FLA
PUMP MOTOR 208-230/1/60
HP
FLA
1, 1 1/2, 2 T
1/3
3.2
1/30
1.3
3 T
1/2
4.3
1/15
.8
5, 7 1/2, 10 T
1
6.7
1/8
1.1
△ REMOTE DEVICE
○ TERMINAL CONNECTION
NOTES:
(1) PANEL HAS (2) INDICATING LIGHTS: ICE FLAKER RUN(GREEN) & MOTOR OVERLOAD (RED)
(2) APPLICATION:
- ALL REMOTE FLAKERS, FREON
- ALL REMOTE FLAKERS, AMMONIA
(3) WHEN FREON FLAKER IS NOT CONNECTED TO A CENTRAL RACK BUT TO A FACTORY SUPPLIED CONDENSING UNIT, THAN AN OPTIONAL PANEL IS AVAILABLE WITH ADDITIONAL INDICATING LIGHTS TO MONITOR COMPRESSOR STATUS.
(4) DUAL PRESSURE REGULATOR APPLIES TO AMMONIA ICE FLAKERS ONLY (SERIES -EA, -EAR). WIRE DUAL PRESSURE REGULATOR TO SAME TERMINALS AS LIQUID LINE SOLENOID VALVE.
(5) WHEN CONNECTING THIS ICE FLAKER TO A CENTRAL FREON REFRIGERATED RACK SYSTEM (OR AMMONIA FLAKER), YOU MUST INSTALL A WIRE JUMPER BETWEEN TERMINALS "A" AND "B"(THIS WILL POWER THE LIQUID LINE SOLENOID VALVE WHEN THE MACHINE IS OPERATING).
(6) CR3 IS AN ISOLATING RELAY IN CONDENSING UNIT. DO NOT JUMPER "A" AND "B" IF CR3 IS USED.
HOWE CORPORATION
E20T40-RL
REMOTE ICE FLAKER CONTROL PANEL
208-230/1/60 POWER; 230/1/60 DRIVE & PUMP MOTORS
230/1/60 & 24/1/60 CONTROL
SIZE
DRAWN BY: RJD
DWG NO WS-115
REV 1
SCALE NONE
03/03/99
SHEET 1 OF 1
GND
L1
L2
208-230/1/60
MAIN DISCONNECT & BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS
M1
T1 DRV
DRIVE MOTOR 208-230/1/60 see table for FLA
CM OVERLOAD TOROID COIL
T2 DRV
T1 PUMP
PUMP MOTOR 208-230/1/60 see table for FLA (thermal protection integral with motor)
A1
R1
A2
FU1 CCMR 2
FU1 T2 PUMP
CR3 see note 6
JUMPER see note 5
SOL A2
SOL A1
LIQUID LINE SOLENOID VALVE
DUAL PRESSURE REGULATOR (AMMONIA ONLY) see note 4
LEVEL CONTROL
LC1
T1
30 VA
230V PRI
24V SEC
SECONDARY LEADS INTERNALLY PROTECTED; DO NOT SHORT
CONTROL MODULE "CM"
"MOTOR OVERLOAD"
"ICE FLAKER RUN"
RMT 0/1
ON/OFF SWITCH
REMOTE ON/OFF
OVERLOAD RESET N.O.

12 Control Panel Wiring Diagrams

460/3/60 WIRING (E20T47)



ICE FLAKER SIZE	DRIVE MOTOR 460/1/60		PUMP MOTOR 230/1/60	
	HP	FLA	HP	FLA
1, 1 1/2, 2 T	1/3	.80	1/30	1.3
3 T	1/2	1.1	1/15	.8

NOTES:

(1) PANEL HAS (2) INDICATING LIGHTS: ICE FLAKER RUN(GREEN) & MOTOR OVERLOAD (RED)

(2) APPLICATION:
- REMOTE FLAKERS, FREON SIZES 1, 1 1/2, 2, & 3T.
- REMOTE FLAKERS, AMMONIA SIZES 1, 1 1/2, 2, 3T.

(3) WHEN FREON FLAKER IS NOT CONNECTED TO A CENTRAL RACK BUT TO A FACTORY SUPPLIED CONDENSING UNIT, AN OPTIONAL PANEL IS AVAILABLE WITH ADDITIONAL INDICATING LIGHTS TO MONITOR COMPRESSOR STATUS.

(4) DUAL PRESSURE REGULATOR APPLIES TO AMMONIA ICE FLAKERS ONLY (SERIES -EA, -EAR). WIRE DUAL PRESSURE REGULATOR TO SAME TERMINALS AS LIQUID LINE SOLENOID VALVE.

(5) WHEN CONNECTING ICE FLAKER TO A CENTRAL FREON REFRIGERATED RACK SYSTEM (OR AMMONIA FLAKER), YOU MUST INSTALL A WIRE JUMPER BETWEEN TERMINALS "A" AND "B"(THIS WILL POWER THE LIQUID LINE SOLENOID VALVE WHEN THE MACHINE IS OPERATING).

(6) CR3 IS AN ISOLATING RELAY IN CONDENSING UNIT. DO NOT JUMPER "A" AND "B" IF CR3 IS USED.

(7) M1-MP CONTACTS CHANGE WHEN DRIVE MOTOR DISCONNECT IS CLOSED.

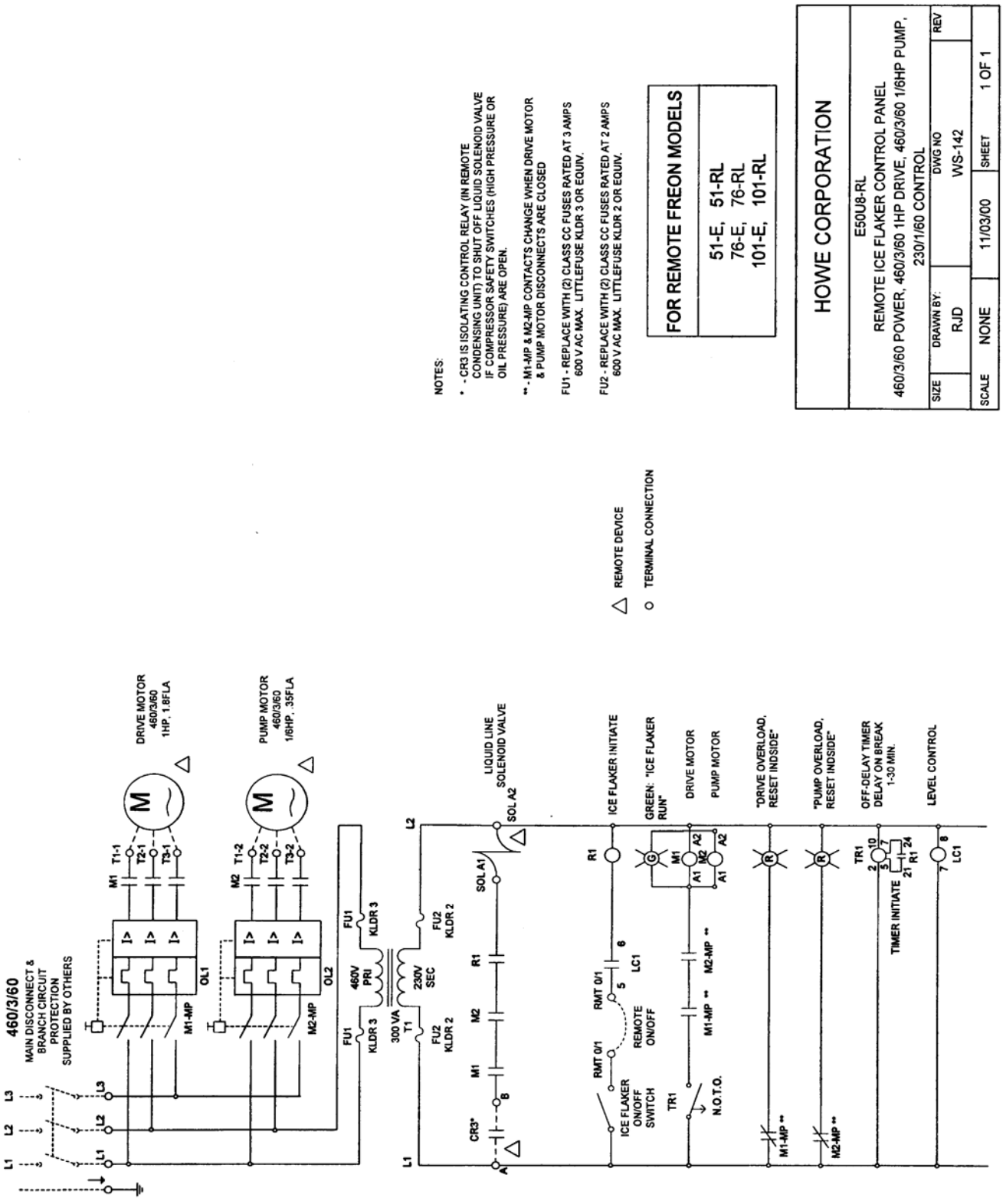
△ REMOTE DEVICE

○ TERMINAL CONNECTION

HOWE CORPORATION			
E20T47-RL REMOTE ICE FLAKER CONTROL PANEL 460/3/60 POWER; 460/3/60 DRIVE MOTOR, 230/1/60 PUMP, 230/1/60 CONTROL			
SIZE	DRAWN BY:	DWG NO	REV
	RJD	WS-117	1
SCALE	NONE	11/03/00	SHEET 1 OF 1

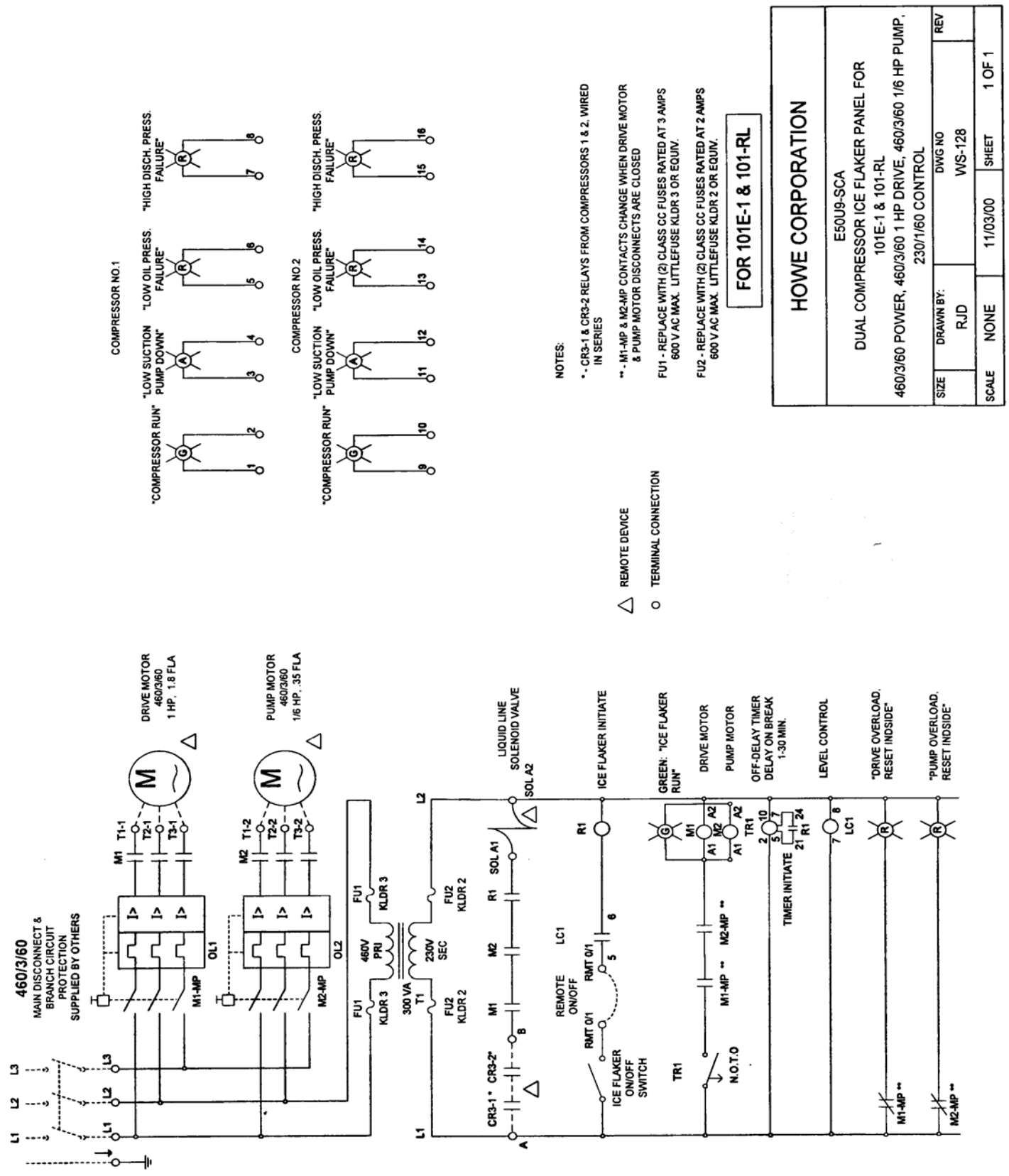
12 Control Panel Wiring Diagrams

460/3/60 Control Panel Schematic (E50U8-RL)
Large Capacity Single Circuit



12 Control Panel Wiring Diagrams

460/3/60 Control Panel Schematic (E50U9-RL)
Large Capacity Dual Circuit


460/3/60
MAIN DISCONNECT & BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS
DRIVE MOTOR 460/3/60 1 HP, 1.8 FLA
PUMP MOTOR 460/3/60 1/6 HP, .35 FLA
M1-MP
M2-MP
OL1
OL2
300 VA T1
460V PRI
230V SEC
FU1 KLDR 3
FU2 KLDR 2
LIQUID LINE SOLENOID VALVE SOL A2
ICE FLAKER INITIATE
GREEN: "ICE FLAKER RUN"
DRIVE MOTOR
PUMP MOTOR
OFF-DELAY TIMER DELAY ON BREAK 1-30 MIN.
LEVEL CONTROL
"DRIVE OVERLOAD. RESET INDSIDE"
"PUMP OVERLOAD. RESET INDSIDE"
ICE FLAKER ON/OFF SWITCH
REMOTE ON/OFF
N.O.T.O
TIMER INITIATE
CR3-1 * CR3-2*
COMPRESSOR NO.1
COMPRESSOR NO.2
"COMPRESSOR RUN"
"LOW SUCTION PUMP DOWN"
"LOW OIL PRESS. FAILURE"
"HIGH DISCH. PRESS. FAILURE"
NOTES:
* - CR3-1 & CR3-2 RELAYS FROM COMPRESSORS 1 & 2, WIRED IN SERIES
** - M1-MP & M2-MP CONTACTS CHANGE WHEN DRIVE MOTOR & PUMP MOTOR DISCONNECTS ARE CLOSED
FU1 - REPLACE WITH (2) CLASS CC FUSES RATED AT 3 AMPS 600 V AC MAX. LITTLEFUSE KLDR 3 OR EQUIV.
FU2 - REPLACE WITH (2) CLASS CC FUSES RATED AT 2 AMPS 600 V AC MAX. LITTLEFUSE KLDR 2 OR EQUIV.
REMOTE DEVICE
TERMINAL CONNECTION
FOR 101E-1 & 101-RL
HOWE CORPORATION
E50U9-SCA
DUAL COMPRESSOR ICE FLAKER PANEL FOR 101E-1 & 101-RL
460/3/60 POWER, 460/3/60 1 HP DRIVE, 460/3/60 1/6 HP PUMP, 230/1/60 CONTROL
SIZE
DRAWN BY: RJD
DWG NO WS-128
REV
SCALE NONE
11/03/00
SHEET 1 OF 1

12 Control Panel Wiring Diagrams

220/1/50 Control Panel Schematic (E20T40-RL-50)

ICE FLAKER SIZE	DRIVE MOTOR 220-240/1/50		PUMP MOTOR 220-240/1/50	
	HP	FLA	HP	FLA
1, 1 1/2, 2 T	1/3	3.3	1/30	1.5
3 T	1/2	4.9	1/15	.90
5, 7 1/2, 10 T	1	8.5	1/8	1.1

△ REMOTE DEVICE

○ TERMINAL CONNECTION

NOTES:

(1) PANEL HAS (2) INDICATING LIGHTS: ICE FLAKER RUN(GREEN) & MOTOR OVERLOAD (RED)

(2) APPLICATION:
-ALL REMOTE FLAKERS, FREON
-ALL REMOTE FLAKERS, AMMONIA

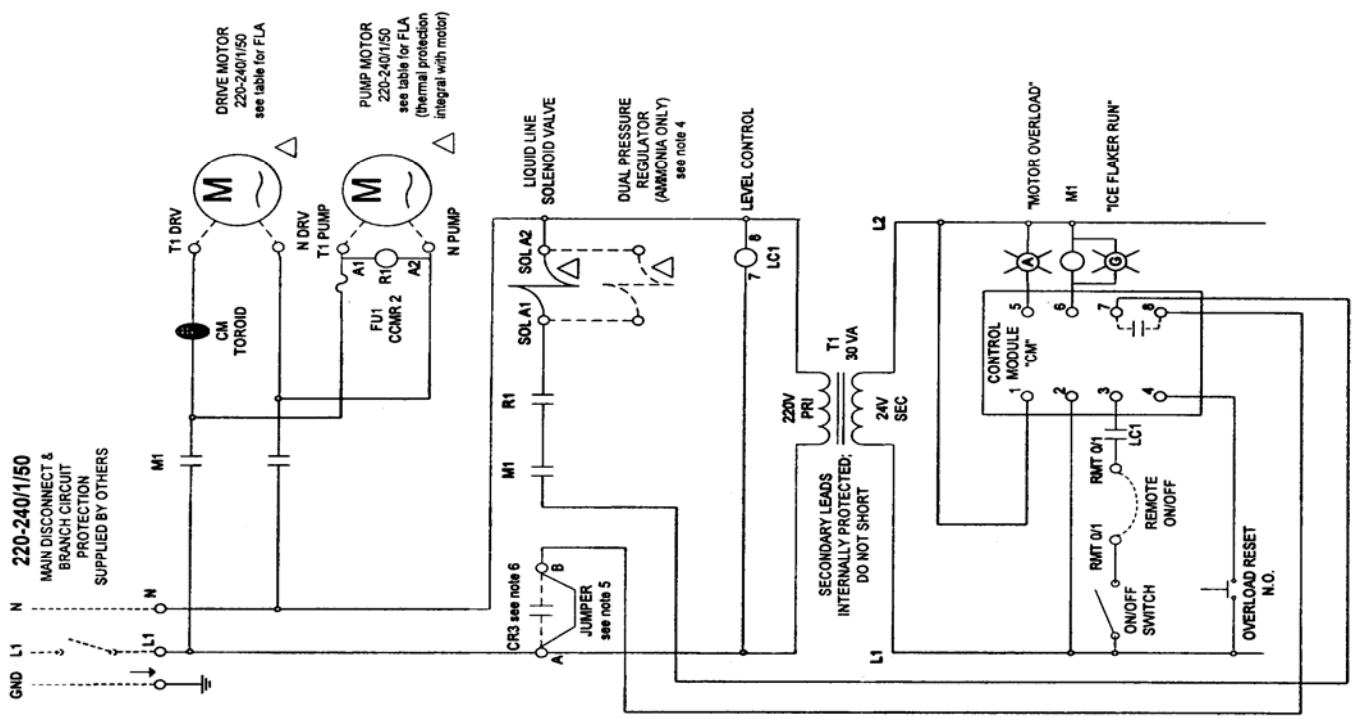
(3) WHEN FREON FLAKER IS NOT CONNECTED TO A CENTRAL RACK BUT TO A FACTORY SUPPLIED CONDENSING UNIT, THAN AN OPTIONAL PANEL IS AVAILABLE WITH ADDITIONAL INDICATING LIGHTS TO MONITOR COMPRESSOR STATUS. CONTACT FACTORY FOR INFORMATION.

(4) DUAL PRESSURE REGULATOR APPLIES TO AMMONIA FLAKERS ONLY (SERIES -EA, -EAR). WIRE DUAL PRESSURE REGULATOR TO SAME TERMINALS AS LIQUID LINE SOLENOID VALVE.

(5) WHEN CONNECTING ICE FLAKER TO A CENTRAL FREON REFRIGERATION RACK SYSTEM, YOU MUST INSTALL A WIRE JUMPER BETWEEN TERMINALS "A" AND "B"(THIS WILL POWER THE LIQUID LINE SOLENOID VALVE WHEN THE MACHINE IS OPERATING).

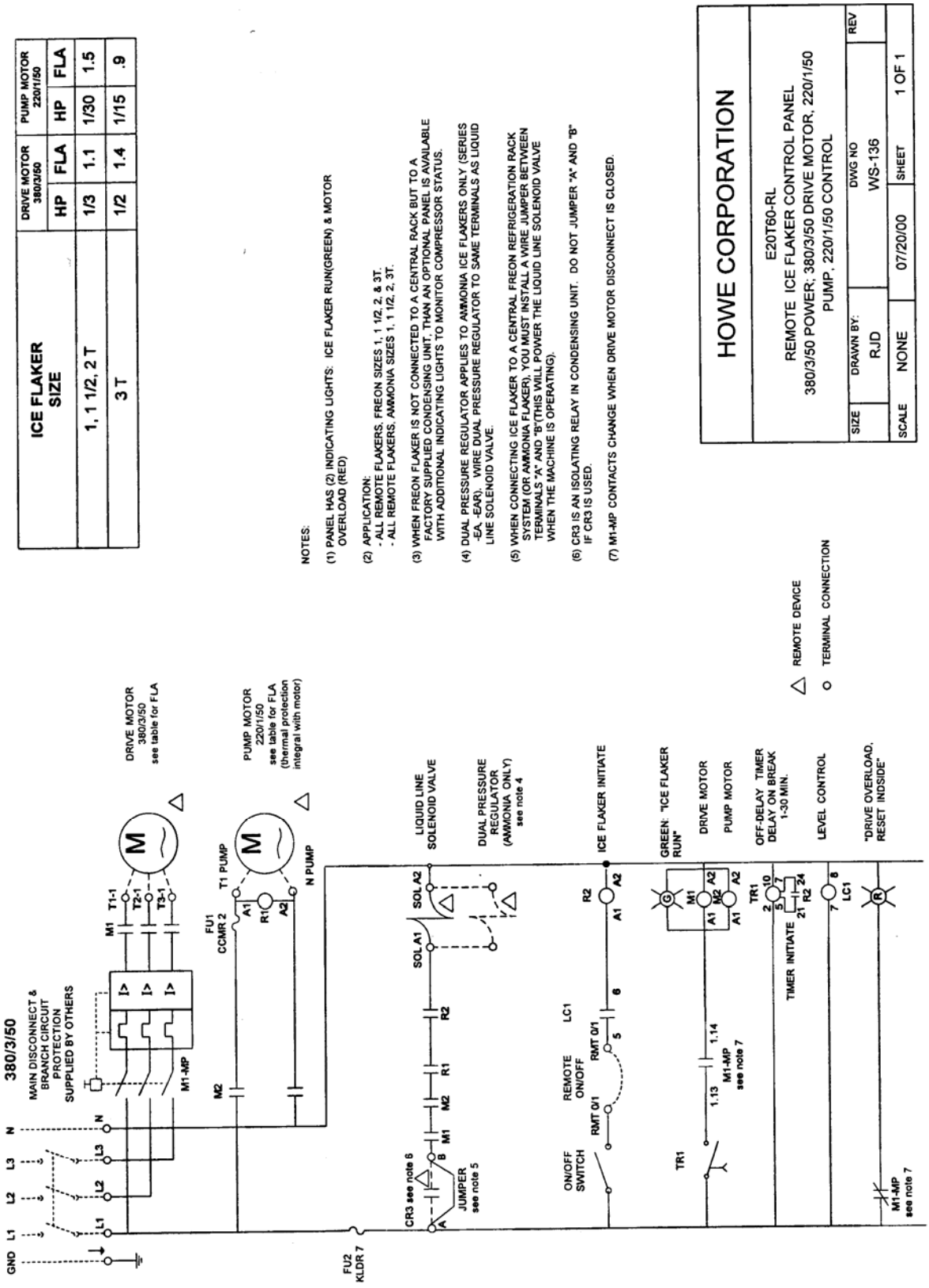
(6) CR3 IS AN ISOLATING RELAY IN CONDENSING UNIT. DO NOT JUMPER "A" AND "B" WHEN CONNECTING ICE FLAKER TO SEPARATE REMOTE CONDENSING UNIT.

HOWE CORPORATION			
	E20T40-RL-50 REMOTE ICE FLAKER CONTROL PANEL 220-240/1/50 POWER; 220/1/50 DRIVE & PUMP MOTORS 220/1/50 & 24/1/50 CONTROL		
SIZE	DRAWN BY:	DWG NO	REV
	RJD	WS-115-50	1
SCALE	NONE	06/05/00	SHEET 1 OF 1



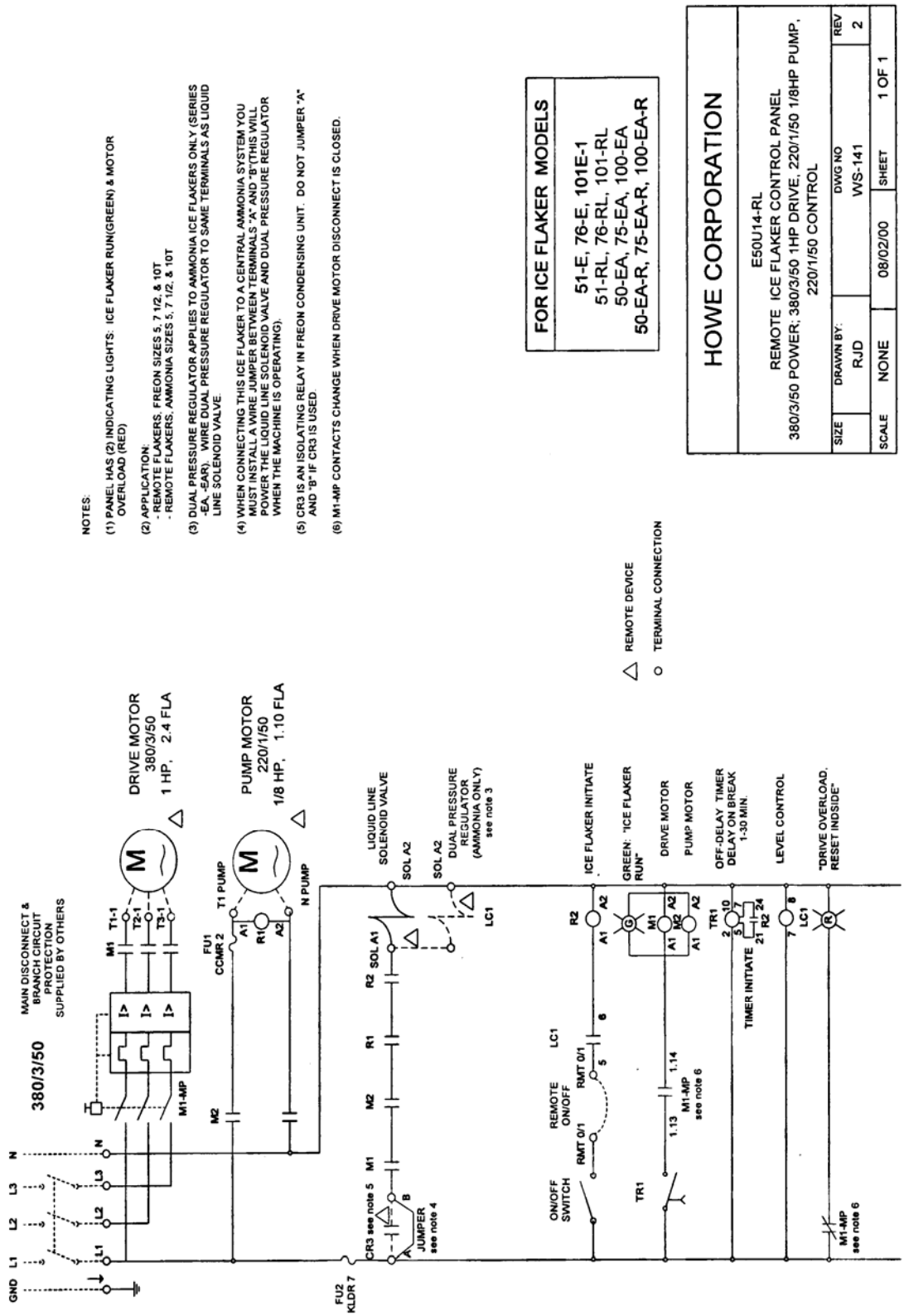
12 Control Panel Wiring Diagrams

380/3/50 Control Panel Schematic (E20T60)



12 Control Panel Wiring Diagrams

380/3/50 Control Panel Schematic (E50U14-RL)
Large Capacity Single Circuit


NOTES:
(1) PANEL HAS (2) INDICATING LIGHTS: ICE FLAKER RUN(GREEN) & MOTOR OVERLOAD (RED)
(2) APPLICATION:
- REMOTE FLAKERS, FREON SIZES 5, 7 1/2, & 10T
- REMOTE FLAKERS, AMMONIA SIZES 5, 7 1/2, & 10T
(3) DUAL PRESSURE REGULATOR APPLIES TO AMMONIA ICE FLAKERS ONLY (SERIES -EA, -EAR). WIRE DUAL PRESSURE REGULATOR TO SAME TERMINALS AS LIQUID LINE SOLENOID VALVE
(4) WHEN CONNECTING THIS ICE FLAKER TO A CENTRAL AMMONIA SYSTEM YOU MUST INSTALL A WIRE JUMPER BETWEEN TERMINALS "A" AND "B"(THIS WILL POWER THE LIQUID LINE SOLENOID VALVE AND DUAL PRESSURE REGULATOR WHEN THE MACHINE IS OPERATING).
(5) CR3 IS AN ISOLATING RELAY IN FREON CONDENSING UNIT. DO NOT JUMPER "A" AND "B" IF CR3 IS USED
(6) M1-MP CONTACTS CHANGE WHEN DRIVE MOTOR DISCONNECT IS CLOSED.
FOR ICE FLAKER MODELS
51-E, 76-E, 101E-1
51-RL, 76-RL, 101-RL
50-EA, 75-EA, 100-EA
50-EA-R, 75-EA-R, 100-EA-R
HOWE CORPORATION
E50U14-RL
REMOTE ICE FLAKER CONTROL PANEL
380/3/50 POWER; 380/3/50 1HP DRIVE, 220/1/50 1/8HP PUMP, 220/1/50 CONTROL
SIZE D
DRAWN BY: RJD
DWG NO WS-141
REV 2
SCALE NONE
08/02/00
SHEET 1 OF 1
REMOTE DEVICE
TERMINAL CONNECTION
MAIN DISCONNECT & BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS
380/3/50
GND L1 L2 L3 N
DRIVE MOTOR 380/3/50 1 HP, 2.4 FLA
PUMP MOTOR 220/1/50 1/8 HP, 1.10 FLA
T1 PUMP
N PUMP
FU1 CCMR 2
FU2 KLDR 7
LIQUID LINE SOLENOID VALVE
DUAL PRESSURE REGULATOR (AMMONIA ONLY) see note 3
CR3 see note 5
JUMPER see note 4
ON/OFF SWITCH
REMOTE ON/OFF
ICE FLAKER INITIATE
GREEN: "ICE FLAKER RUN"
DRIVE MOTOR
PUMP MOTOR
OFF-DELAY TIMER DELAY ON BREAK 1-30 MIN.
TIMER INITIATE
LEVEL CONTROL
"DRIVE OVERLOAD, RESET INDSIDE"
M1-MP see note 6

13 Maintenance

Evaporator

To keep the evaporator in peak performance, the ice maker should be cleaned with an approved ice machine cleaner at least twice a year, more often if water conditions cause mineral build up, using an approved food grade ice machine cleaner. The water pump is used to circulate ice machine cleaner through the system. Refer to cleaning instructions below for complete cleaning instructions.

Ice Machine Cleaning Instructions

An important part of ice flaker maintenance is to clean it frequently so that the water passages are not clogged and the freezing surface is clear and free of scale caused by calcium and iron deposits.

Frequency of cleaning depends upon the quality of water. In extreme hard water areas, it may be necessary to clean the flaker as often as every 2 months whereas in normal or "soft" water areas twice a year may be sufficient.

When cleaning is necessary, proceed as follows:

1. Turn off refrigeration compressor. If flaker is connected to a compressor rack, close the liquid line shut off valve.

2. Remove all ice in storage bin.

3. Close water supply shut off valve.

4. Drain water from drain connection in water sump. Some models are equipped with a drain valve, others have a drain plug, located below the water float valve connection.

5. Prepare the cleaning solution: Mix 8 oz. of ice machine cleaner with 3 quarts of hot water. Water should be between 90-115°F. If using an alternate ice machine cleaner such as Virginia cat no. 418 follow instructions on bottle.

*** CAUTION ***
ICE MACHINE CLEANERS CONTAIN ACIDS AND MAY CAUSE BURNS. HANDLE WITH CARE IN CASE OF EXTERNAL CONTACT, FLUSH WITH WATER. IF SWALLOWED ● SEEK IMMEDIATE MEDICAL ATTENTION!.
USE APPROVED ICE MACHINE CLEANER ONLY. MIX SOLUTIONS PER MANUFACTURERS INSTRUCTION.
*** CAUTION ***

6. Pour solution of ice machine cleaner into sump, to normal operating level. Do not overfill because it may overflow into bin.

7. Start the ice flaker drive motor and water pump to circulate cleaning solution over the freezing surface and all water passages. Operate until all scale is removed. This may require from half hour up to about 2 hours if scale build up is heavy.

8. When system is clean, drain cleaning solution and rinse with 2 or more complete rinses to ensure that cleaning solution is flushed away thoroughly. At each rinse, fill sump with fresh water and run drive motor and water pump for 10 minutes, then drain.

TO SANITIZE:

9. Mix a solution of approved sanitizer or mix 16 oz. of household bleach with 2 gallons of warm water, 90-115°F.

10. Pour solution into sump, to normal operating level (as in #6), then re-circulate sanitizing solution for approximately 20 minutes, by turning on drive motor & pump.

11. Drain solution and rinse thoroughly with fresh water at least twice, following procedure described in No.8.

12. After ice flaker is thoroughly rinsed, return machine to normal operation by opening water supply valve and restoring refrigeration.

Water Distribution Tubes

Water distribution tubes should be kept clean and free of any mineral buildup. When they do accumulate mineral deposits, the flaker must be thoroughly cleaned. Carefully inspect each distribution tube and fitting for leaks or crack. Replace defective tubes when necessary.

Water Sump

Water sump and pump should be kept clean and free of any mineral buildup. When mineral deposits accumulate the machine must be thoroughly cleaned. The water sump will be cleaned when you normally clean the equipment by circulating the ice machine cleaner through the water system. In extreme cases of mineral or slime buildup, shut off the main power and remove the top covers from the sump, and using the ice machine cleaner and a scrub brush clean the aluminum casting until the deposits are removed.

Ice Bin Drip Pan

The ice bin drip pan should be cleaned each time the ice flaker is cleaned. The pan should be wiped clean to remove any mineral or slime deposits. The drain line should also be flushed to allow condensate to drain freely from the drip pan.

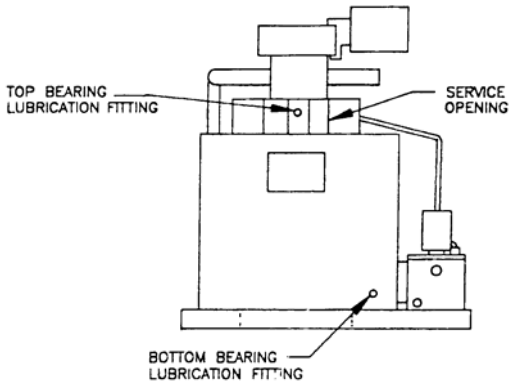
13 Maintenance

Lubrication

Bearings & Seals

Main Bearings on the ice flaker must be lubricated every 3 months with a FDA approved edible grease. The grease fittings are easily accessible from the front of the flaker; the top bearing is lubricated through the inspection (service) opening, the bottom bearing is lubricated through one of the ribs located on the front of the machine in the lower right corner near the water sump. (O*n small capacity units with out rib heaters only. For large capacity, & units with rib heaters, lower grease fitting is on the center hub, on the bottom casting.)*

Bearing Lubrication points
(Exhibit 36)



Speed Reducer Lubrication

Grease Fitting

The speed reducer must be lubricated (greased) every six months with a standard bearing grease (not food grade).

Oil Change

The oil in a new speed reducer should be changed at the end of 250 hours of operation. Under normal conditions, after the initial oil change, the oil should be changed after every 2,500 hours, or every six months, whichever occurs first. Periodic examination of oil samples taken from the unit will help establish the appropriate interval.

Low Temperature Oil

When operating the ice flaker in low ambient temperatures, (colder than 50°F). The gearbox oil must be changed from the standard mineral oil to a synthetic oil. The synthetic oil is appropriate for lower temperatures as well as having a longer operating life resulting in less frequent oil changes.

Mechanical Cleaning
Refer to page 57 for cleaning procedure.

Preventative Maintenance

13 Maintenance

Preventative maintenance means that the store or department manager (or a designated employee) make a daily visual check of the ice flaker.

Check for...

Bin doors are working (closing) properly
Bin doors are kept closed
Photo eyes and brackets are in proper alignment
Ice Quality (Size of flakes)
Ice Quantity (Normal amounts of ice produced)
Bubbles in sight glass
overall cleanliness of the flaker
any unusual noises.

When these items are checked on a daily basis, any change will be easily detected prior to any service call for a malfunction of the machine.

Preventative Maintenance Schedule

	3 month	6 month	9 month	12 month
Clean ice machine (as required*)	●	●	●	●
Grease Top & Bottom Bearings	●	●	●	●
Check if flaker is harvesting properly	●	●	●	●
Check for bubbles in sight glass	●	●	●	●
Clean Electric Eyes/ Check Alignment	●	●	●	●
Inspect flaker for damaged parts **	●	●	●	●
Check & replace (if Necessary) gearbox oil		●		●
check bearing wear				●
check cutter blade clearances				●

*** Typically every 3-6 months. In areas with poor water quality, possibly as often as every month. With good quality water, cleaning may be required only once a year.**

**** parts to check for damage are: ice deflector, ice deflector scraper, squeegee & wrapper, water distribution tubes and float valve.**

14 Trouble Shooting Chart

PHOTO EYE

PROBLEM	PROBABLE CAUSE	REMEDY
Ice maker is NOT shutting off when bin is full, and, signal light on photo-eye module is not flickering.	Photo-eye not installed.	Install photo-eye control.
	Output relay on power module is not transferring. (After 15 sec. delay)	Power module defective, replace module.
	Transmitter or receiver defective.	Replace defective eye. (see trouble shooting on page 34)
Signal light on photo-eye module is flashing slowly.	Transmitter or receiver lens is dirty.	Clean dirty lens.
	Transmitter and receiver eyes are out of alignment.	Re-align eyes so the signal light will flicker at a quick pace (the stronger the signal, the quicker the LED flashes).
Ice maker will not start, and, signal light on power module IS flickering quickly.	Power module output will not close (after 15 sec. delay).	Insert jumper between terminals 4 and 6 on the module base. If machine starts, then module is defective. Replace module.
	Remote (optional) on-off switch is open, (off).	Turn all switches to ON position.
Ice maker starts immediately after ice is removed from beam path.	Time 2 (off delay) adjusted to minimum setting.	Turn time 2 (off delay) potentiometer clockwise to maximum setting (15 seconds)
	Power module programmed for on delay only.	Reprogram power module for both on and off delays.
Ice maker solenoid valve "chatters" as ice falls past beam path.	Time 1 (on delay) adjusted to minimum setting.	Turn time 1 (on delay) potentiometer clockwise to maximum setting (15 seconds)
	Power module programmed for off delay only.	reprogram power module for both on and off delays.

CONTROL MODULE

Ice flaker is not running.	No control power from control transformer (secondary 24	Using a digital voltmeter set @ AC voltage, check voltage between 1 & 2 on

14 TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
	VAC).	control module, voltage reading should be 24 VAC. If 24 VAC is not present, control transformer may be defective, check & replace.
	Control switch(es) open. Check voltage between terminals # 1 & 3,	Check switches and ice level control for proper operation. Close switches, or replace if defective. a) Switch(es) open, voltage should be 0 VAC b) Switches closed, voltage should be 24 V AC
Drive motor contactor is not energized. Solenoid valve is energized.	Control module output is defective, or contactor coil burnt, or open wire in circuit.	Check voltage between 2 & 6 If
		24 VAC present, output is defective, replace module.
		0 VAC present, module output (#6) is OK; check wiring or contactor coil
Solenoid valve not energized. Drive motor contactor is energized.	Control module isolated contacts will not close (provided all switches are closed), or power is not brought to $line_A$ from $line_2$, or solenoid coil defective.	Remove wires from 7 & 8, set meter to ohms, and check for continuity between terminals 7 & 8, ((while module is energized, all switches in the on (*closed)* position.)
		Contacts open, output defective, replace module.
		Contacts closed, Module output OK, Check line "A" jumper or CR_3 contacts. (see wiring diagram) Check wiring or solenoid coil.
Drive motor always stays on.	Power is maintained to input # 3. on-off switch(es) and or ice level control (is) are not shutting off.	Check on-off switch(es) and ice level control for proper operation, replace if defective.

14 Trouble Shooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
Liquid line solenoid valve energized always.	Control module isolated contacts will not open.	Replace defective control module.
ICE STORAGE & REMOVAL		
Ice flakes frozen together into a hard block of ice in storage bin.	Lead tube splashing water off the ice deflector, into the storage bin.	Adjust lead tube, so that it doesn't splash water over the ice deflector.
	Drip pan leaking into storage bin.	Repair or replace drip pan.
	Humidity level in bin too high because:	
	a) Improper amount of insulation on bin.	Re-insulate or replace bin.
	b) Bin not sealed properly.	Reseal or replace bin.
	c) Bin door left open.	Keep bin door closed when not removing ice.
(cont.)	Ice left in storage bin too long because ice usage too small.	Remove All ice out of bin daily, or, Install clock timer to limit the time the flaker produces ice. Match daily ice production with daily ice consumption.
FREEZING		
	2) TXV superheat setting is 3) too high.	Decrease superheat setting (open valve) ½ turn at a time until ice is ***harvested*** down to bottom of drum.

14 TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
	Improper location of TXV bulb. (located at ice flaker suction outlet).	Relocate bulb approximately 6" from inlet side of suction line heat exchanger (if equipped) or on the horizontal section of the suction line, at approximately 5 O-clock position. Clamp securely and insulate.
	4) Head pressure is too low.	Head pressure control improperly adjusted or defective. Adjust as necessary, or replace defective control.
	5) Liquid line drier dirty.	Replace filter drier.
Ice freezes and harvests top to bottom of drum, but on side only. Opposite side does not harvest.	Ice blade clearance too high.	Adjust ice blade clearance. (see instructions in Section 11, Service & Adjustment).
	Dull ice blade (refers to old style carbon steel blades only)	Replace dull carbon steel ice blade with new stainless steel blade.
	3) Main bearings worn.	Replace worn bearings, inspect and repair/replace shaft if worn.
	Mis-assembled top casting, after bearing replacement.	See section 11 Service & adjustments bearing replacement procedure, and re-align/assemble top casting.
Ice freezes soft on entire length of drum, ice flaker drive motor cuts out on overload a few minutes after start-up.	Almost entire refrigerant charge in accumulator, little or no liquid in receiver.	Pump out accumulator, restart system. Adjust TXV if necessary.
ce freezing hard on entire length of drum, but harvesting poorly and at	Water quality not suitable (hard water).	Install Howe Phosphate Filters.

14 Trouble Shooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
random, with no specific pattern. Leaves strips of ice at upper end of drum, some at lower end, etc.	Freezing surface coated with hard water deposits.	Clean evaporator with ice machine cleaner to remove deposits.
No ice freezing on drum and compressor short cycles.	) Loss of refrigerant charge.	Inspect for and repair leaks, charge to proper refrigerant levels.
	Dead power element on TXV.	Replace power element.
I Ice flaker makes ice intermittently and compressor short cycles.	Insufficient water supply to ice flaker because:	
	Water supply line undersized.	Install water supply line of proper size.
	Water supply less than 20 PSIG.	Consult factory.
	c) water filters clogged.	Replace filters every 6 months or sooner if necessary. (Back flushing filter may temporarily work until replacement filters arrive.)
II Ice flakes too thin.	Evaporating Temp. too high because:	
	TXV overfeeding, compressor frosted.	Pinch down TXV (close ½ turn at a time).
	b) EPR set too high.	Adjust EPR for evaporating temp. between -5°F and -10°F. (Freshwater) (-30°F to -35° F for seawater)
	Condensing unit not producing rated capacity because:	
	Compression valves broken.	Repair/service compressor/condensing unit.
	Condenser dirty. (Head press. too high)	Clean fin coil (air cooled unit) Clean tubes (water cooled units).

14 TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
	Head pressure controls defective.	Replace defective head pressure control. (Headmaster Control)
	Condensing unit undersized.	Replace unit with properly sized condensing unit.
Ice flakes too small and too "powdery"	Evaporating temp. too low because condensing unit is oversized.	Install EPR and adjust evaporating temperature between -5°F and -10°F. (-30°F to -35° F for seawater)
Ice flaker "chatters" excessively, does not run smoothly.	Dull carbon steel ice blade.	Replace ice blade with stainless steel blade. Operation with excessive "chatter" may result in damage to speed reducer, motor, coupling and main bearings.
	Excessive ice blade clearance.	Inspect and adjust ice blade clearances. (see section 11, service & adjustment).
	Worn main bearings and/or shaft.	Replace bearings and/or shaft (if worn) (see section 11, service & adjustment).
oo much ice accumulation in bottom water collecting trough.	Ice deflector not properly positioned.	Reposition ice deflector. (see section 11, service & adjustment)
oo much ice accumulation in bottom water collecting trough and in water sump, and excessive ice build up on bottom 3 "ribs"	Ambient temperature too cold.	Install cartridge heaters in ribs, ** flaker must be ambient temperatures above 40°F.
	Water temperature too cold.	Water temperature must be above 40°F. Install water mixing valve to supply 60°F (ideally) water to ice flaker.
Ice in storage bin too wet. (Water dripping into bin with ice).	Water level in sump set too high (water overflows bottom collecting trough)	Adjust water float valve to maintain water level ¼" below water return trough

14 Trouble Shooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
	Water overflowing top water distribution pan because:	
	Water distribution tubes plugged.	Unplug all distribution tubes.
	Water pump delivering too much water to pan.	Adjust water regulating valve (ball valve located near water pump)
	One or more water distribution tubes broken.	Replace all defective water distribution tubes.
	Ice flaker not harvesting down to bottom of freezing drum.	See problem I.
DRIVE MOTOR		
rive motor amps too high, cuts out on overload as soon as ice starts to freeze on drum.	) Dull carbon steel ice blade.	Replace blade with new stainless steel ice blade.
	Worn gear(s) in speed reducer.	Repair or replace speed reducer.
lotor amps too high, reach a peak reading at a certain position on the drum.	) Broken gear tooth in speed reducer.	Repair or replace speed reducer.
	) Dull carbon steel ice blade.	Replace blade with new stainless steel ice blade.
	ce blade adjusted closer than .003 clearance at that position.	Readjust ice blade clearance. (see section 11, Service & adjustment).
lotor runs and main shaft turns only when there is no ice on drum.	Woodruff key in speed reducer sheared (on slow speed gear on output shaft).	Repair or replace speed reducer.
Motor does not start when system is turned on.	a) Defective off delay timer	Replace timer.
	) Defective bin level control	See Photo Eye problems page 61.
Motor does not shut off when system is turned off. (After normal time delay period)	Defective off delay timer	Replace timer.
lotor cuts out on overload, but amps do not exceed nameplate F.L.A.	Electronic overload set too low	Adjust potentiometer clockwise ⅛ turn at a time.

14 TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
	) Improperly sized thermal overloads.	Check ratings and install properly sized overload heaters.
Motor burnt out, speed reducer output shaft broken.	) Dull carbon steel ice blade.	Replace ice blade with new stainless steel ice blade, repair or replace burnt out motor, repair or replace defective speed reducer.
	Electronic overload setting too high.	Adjust potentiometer counter-clockwise ⅛ turn at a time.
Motor burnt out or off on overload, ice deflector broken or bent out of shape.	Ice storage bin was full of ice and flaker continued to operate. No ice level control, or defective ice level control.	Install suitable ice level control.
	SPEED REDUCER	
il leaking between front of motor and motor mounting flange.	Worn high speed oil seal in speed reducer.	Replace leaking high speed oil seals.
Oil leaking evident on top of flexible coupling.	Worn slow speed oil seal in speed reducer.	Replace leaking slow speed oil seal.
peed reducer output shaft and ice flaker main shaft do not turn, but motor runs.	Woodruff key in speed reducer sheared because: electronic overload set too high). (woodruff key locks slow speed gear to output shaft.)	Repair speed reducer and readjust overload setting.
	Ice flaker motor started while ice blade was frozen in stationary position to freezing drum. Control circuit has no off delay timer, (or timer circuit is defective).	Install off delay timer in circuit. (see wiring diagram) or install New Rapid Freeze control panel. Repair speed reducer.
	Control circuit has off delay timer, but disconnect switch was used to start and stop ice flaker instead of on-off switches.	Disconnect switch should stay on continuously except for servicing. Install new Rapid Freeze control panel.

14 Trouble Shooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
		Repair speed reducer
	Ice blade frozen to evaporator during power failure.	**Electronic overload may be set too high. Adjust so it will trip upon overload condition before damaging gearbox, motor or coupling.** **Repair speed reducer.**
peed Reducer output shaft broken, motor burnt out or off on overload.	**Operating ice flaker for an extensive period of time with dull ice blade causing excessive chatter.**	**Replace ice blade with new stainless steel blade, also replace flexible coupling.** **Repair or replace speed reducer.**

*** IMPORTANT SAFETY NOTICE ***

his information is intended for use by individuals possessing adequate background in ectrical, refrigeration and mechanical experience. Any attempt to repair major equipment ay result in personal injury and / or property damage. The manufacturer or seller cannot be esponsible for the interpretation of this information, nor can it assume any liability in onnection with its use.

*** IMPORTANT SAFETY NOTICE ***

*** DANGER ***

he control panel on this ice flaker may be powered by TWO SEPARATE power sources. isconnect BOTH SOURCES prior to servicing this piece of equipment. Failure to do this ay potentially cause an electrocution hazard.!!

*** DANGER ***

*** WARNING ***

nly technically qualified persons, experienced and knowledgeable in the handling of efrigerants and operation of refrigeration systems, should perform the operations described in is manual.

*** WARNING ***

REPLACEMENT & ADJUSTMENT OF ICE DEFLECTOR

2000 - 6000 POUND MODELS

To properly install, the upper edge of the deflector should be positioned approximately 1/8" BELOW the aluminum lip under the evaporator.

The ice deflector should be centered beneath the ice cutter blade so that as the ice is removed from the evaporator, it will be deflected into the ice bin opening, away from the water collecting trough. The ice deflector prevents ice from dropping into the water collecting trough.

TO REPLACE THE ICE DEFLECTOR PROCEED AS FOLLOWS:

Shut off ice flaker and allow machine to "pump down" (de-ice). Once the machine is clear of ice , disconnect the main power to the ice flaker and LOCK THE DISCONNECT SWITCH IN THE OFF POSITION (to prevent accidental start up).

Remove the service access cover on the top casting.

Remove 2 or 3 water distribution tubes for easier access.

Reaching down into the freezing chamber, loosen and remove the two 1/4" bolts holding the existing ice deflector in place.

Remove the damaged ice deflector through the service opening.

Position and bolt the new ice deflector to the shaft. Tighten the bolts with the deflector adjusted to within 1/8" but NOT touching the evaporator surface or aluminum casting.

Re-install water distribution tubes.

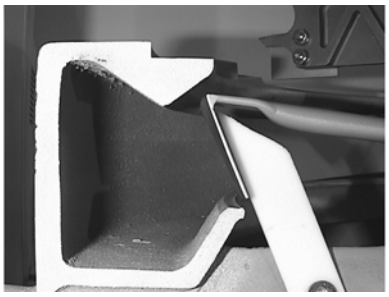
Remove all tools from inside the machine and re-attach the service access cover.

Remove lock-out device from the main power disconnect and turn on the main power.

Turn on the ice flaker switch (you may need to press the overload reset button), and check the deflector to ensure that it does not touch the evaporator or aluminum casting.

If the deflector makes contact with the evaporator surface or aluminum casting at any point, shut down the machine and repeat the above steps to readjust the deflector.

ICE DEFLECTOR ADJUSTMENT
(EXHIBIT 37)



REPLACEMENT & ADJUSTMENT OF ICE DEFLECTOR

5 TON - 10 TON MODELS

To properly install, the upper edge of the deflector should be positioned approximately ¼" BELOW the aluminum lip under the evaporator.

The ice deflector should be centered beneath the ice cutter blade so that as the ice is removed from the evaporator, it will be deflected into the ice bin opening, away from the water collecting trough. The ice deflector prevents ice from dropping into the water collecting trough.

TO REPLACE THE ICE DEFLECTOR PROCEED AS FOLLOWS:

Shut off ice flaker and allow machine to "pump down" (de-ice). Once the machine is clear of ice, disconnect the main power to the ice flaker and LOCK THE DISCONNECT SWITCH IN THE OFF POSITION (to prevent accidental start up).

Reaching UP from the bin into the freezing chamber, loosen and remove the two 5/16" bolts holding the existing ice deflector brackets in place.

Remove the damaged ice deflector and / or brackets.

Assemble the new brackets and deflector but do not tighten yet.

Position and bolt the new ice deflector and brackets to the shaft. Tighten all the bolts (two to the shaft, and two to each side of the deflector & brackets.) with the deflector adjusted to within ¼" but NOT touching the evaporator surface or aluminum casting.

Remove all tools from inside the machine.

Remove lock-out devise from the main power disconnect and turn on the main power.

Turn on the ice flaker switch, (you may need to press the overload reset button) and check the deflector to insure that it does not touch the evaporator or aluminum casting.

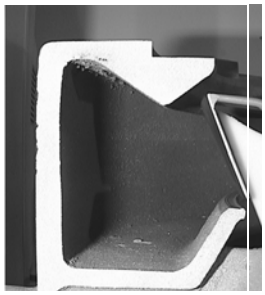
If the deflector makes contact with the evaporator surface or aluminum casting at any point, then shut down the machine and repeat the above steps to readjust the deflector.

REPLACEMENT & ADJUSTMENT OF ICE DEFLECTOR SCRAPER.

2000 - 6000 pound models only!

The ice deflector scraper is mounted on one of the three bottom ribs using two ¼-20 stainless bolts and nuts. The scraper's primary purpose is to clear any buildup of ice on the ice deflector as the deflector passes by the scraper. When properly positioned, the scraper will be approximately ⅛ above the deflector blade. When replacing the scraper, it may be necessary to cut the angled edge down to the proper size. This may be cut with either aviation snips or a razor knife.

ICE DEFLECTOR SCRAPER ADJUSTMENT
(EXHIBIT 39)



REPLACEMENT & ADJUSTMENT of the SQUEEGEE & SQUEEGEE WRAPPER

Shut off ice flaker and allow machine to "pump down" (de-ice). Once the machine is clear of ice, disconnect the main power to the ice flaker and LOCK THE DISCONNECT SWITCH IN THE OFF POSITION (to prevent accidental start up).

Remove the service access cover on the top casting.

Remove 2 or 3 water distribution tubes for easier access.

Reaching down into the freezing chamber, loosen and remove the two 5/16" bolts holding the existing squeegee & squeegee wrapper in place.

Remove the squeegee & wrapper assembly through the service opening. If the squeegee wrapper is not bent out of shape or pitted with rust, then you can remove the rubber squeegee from the wrapper and install a new squeegee in your existing wrapper.

Reinstall the squeegee & wrapper assembly onto the mounting bracket in the freezing chamber, hand tighten the nuts with the squeegee touching the evaporator surface, then move the squeegee assembly approximately 1/16" to 1/8" closer to put a little pressure on the squeegee causing it to bend slightly so that it will drag on the evaporator surface.
Do not install the squeegee assembly so close to the evaporator so that the squeegee bends excessively. (This may cause premature squeegee wear and increase load on the gearbox and drive motor).

Tighten down the nuts and bolts only until the lock washers lock. Do not over tighten bolts, as this may cause distortion of the squeegee wrapper and possibly cause premature squeegee wear.

Re-install water distribution tubes.

Remove all tools from inside the machine and re-attach the service access cover.

Remove lock-out devise from the main power disconnect and turn on the main power.

Turn on the ice flaker switch, (you may need to press the overload reset button) and check the squeegee to ensure that it touches the evaporator on the entire circumference of the freezing chamber.

If the squeegee loses contact with the evaporator surface at any point, then shut down the machine repeating the above steps to readjust the squeegee a little closer.

REPLACEMENT & ADJUSTMENT OF ICE CUTTER BLADE

Ice blade setting clearance between extreme outboard tip of ice blade and evaporator freezing surface must be between .004" to .006" with evaporator at room temperature.

1) locate exact position on evaporator freezing surface where the clearance between the tip of ice blade and freezing surface is the least. This is accomplished with the use of a feeler gauge. Check clearance at the top and bottom of the blade, rotate the blade 60 degrees and recheck clearance. Repeat this operation at a minimum of six points on the circumference of the evaporator in order to determine the point of least clearance accurately.

2) With the ice blade rotated to the point of least clearance, set gap between the ice blade and evaporator surface to between .004" and .006" at the top and bottom of the blade. Tighten the blade mounting bolts and re-check clearance.

REPLACEMENT & ADJUSTMENT of the WATER DISTRIBUTION TUBES

Adjust lead tube (bottom spout with 90° elbow), so that the water is dispersed over the evaporator and it doesn't splash water over the ice deflector.

The side spouts are positioned so the ends of the tubes are approximately ¼" away from the surface, along the top edge of the evaporator.

When a tube or fitting is broken in the distribution pan, the remaining fitting can be removed from the pan by using an Easy-Out removal tool. Once the broken piece is removed, the replacement tube and fitting may be installed and adjusted.

REPLACEMENT OF DRIVE MOTOR

Disconnect main power to the ice flaker. Remove electric wiring cover on the drive motor. Remove the power leads attached to terminals marked L_1 and L_2.

Refer to exhibit 30 The drive motor is attached to the gearbox with (4) ⅜ bolts, through the motor mounting plate. Remove the (4) bolts. The motor may be removed by pulling it away from the gearbox. There are no set screws or couplings, the motor shaft fits directly into the hollow high speed input shaft on the speed reducer with a ¼" key. If the old motor cannot be removed easily, then locate

two threaded holes on the motor mounting plate. They will be on the horizontal center line, one on each side of the input shaft. Insert one of the mounting bolts into each threaded hole so they push against the drive motor (you may have to rotate motor housing so the bolts can press against the mounting lugs on the motor, making sure the bolts do not thread into the mounting lugs.) Turn both bolts until they are hand tight, then turn each bolt ½ turn at a time, alternately until the motor if free enough to remove by hand.

When installing the new motor, place the ¼" key on the shaft, lightly grease the surface of the motor shaft, and insert in the hole on the high speed input shaft, keeping the keyway aligned with the key. When the motor is in place, rotate it until the mounting lugs are aligned with the (4) mounting holes on the motor mounting plate on the speed reducer. Insert a bolt in each hole and tighten.

Re attach the flexible power cable to the motor, connect the power leads to terminals marked L_1 and L_2, check to insure the motor is wired for the correct power (115 or 230) and for the correct rotation (CCW). Refer to wiring connections on the motor nameplate for the correct connections.

When the motor is reattached and connected, turn on power and check operation. Place an ammeter on the power line and check to insure the motor is drawing within the nameplate FLA.

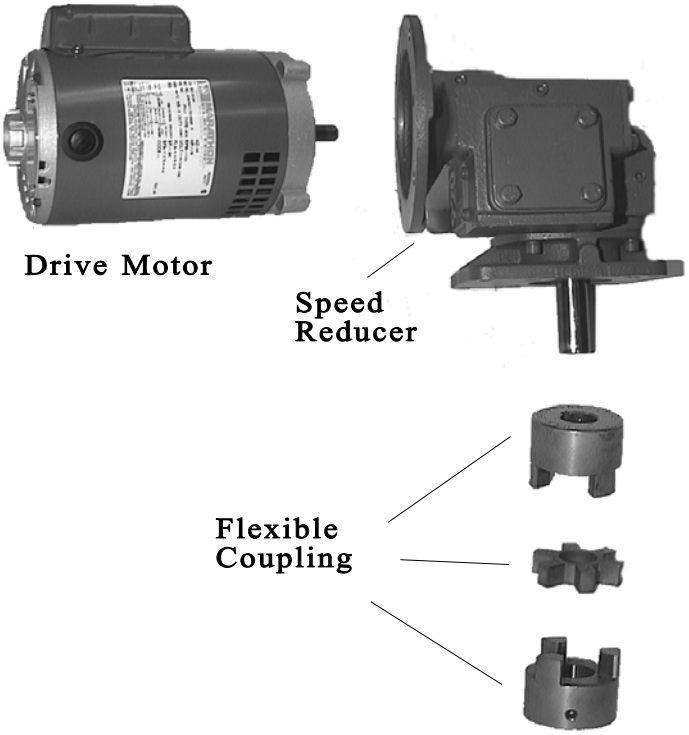
REPLACEMENT OF SPEED REDUCER & FLEXIBLE COUPLING

Disconnect main power to the ice flaker. Refer to exhibit 30. Remove the drive motor as described above, remove (4) mounting bolts attaching the gearbox to the top aluminum casting. The gearbox can then be lifted straight up. The top part of the flexible coupling will lift off with the gearbox, the bronze star and bottom part of the coupling will stay attached to the main shaft.

Loosen the set screw on the top part of the coupling to remove it from the gearbox. Care should be taken to avoid oil from seeping out the relief vent (located on the top if the gearbox in a set screw) if the gearbox is turned on its side or up side down. The bottom part of the flex coupling is attached to the shaft with a set screw. Loosen the set screw then lift the coupling off the shaft. The use of a gear puller may be required to assist in removing either part of the coupling.

Install the new (or existing, if it is not damaged) flex coupling to the shaft and speed reducer, lining up the keyways with the key. Re-tighten the set screws in both parts. Place the bronze star on the bottom part of the coupling. Install the gear box (with top coupling attached) onto the top casting, over the bottom part of the flex coupling. If the gearbox does not sit on the top casting properly, you may need to loosen one or both of the set screws on the flex coupling to allow the gearbox to seat on the machined surface of the casting. There should also be a 1/16" gap between the top coupling half and the bronze star. Rotate the gearbox COUNTERCLOCKWISE ONLY until the mounting holes line up. Once aligned re-install the mounting bolts. Reposition coupling halves with required clearance and re-tighten.

(EXHIBIT 40)



REPLACEMENT OF MAIN BEARINGS 2000-6000 lb MODELS

1) Remove motor and speed reducer by taking out the 4 - 3/8" cap screws, from the top aluminum casting.
2) Remove the lower half of the flexible coupling.
3) Remove rivets which retain the outer stainless steel jacket around the ice flaker. Push the stainless jacket away from the body of the ice flaker.
4) Cut away at the upper 3 inches of insulation uncovering 4 - 3/8" cap screws which bolt the upper aluminum casting to the evaporator.
5) Using a rubber mallet, gently tap the aluminum casting from below (upwards) to free it from the evaporator. Adhesive is used to retain the rubber insulating ring in place.
6) Lift up on the aluminum casting and slide it off the shaft.
7) Loosen rubber squeegee mounting bolts and push squeegee away from the evaporator surface.
8) Lift the shaft assembly out of the evaporator. Be careful to avoid scratching evaporator freezing surface with the ice blade.
9) Examine shaft journals for wear. If worn, repair or replace shaft.
10) Remove old oil seals in upper casting.
11) Drive out bearing in upper casting, using a drift pin or properly sized wood block. Note: To avoid distortion of casting it should be supported near the bearing area and not on the outer edge.
12) Drive new bearing into position. Then press the new oil seals into position.
13) To remove the bottom bearing, first remove the bottom bearing cover, and the old bearing plate.
14) Now follow the same steps as were done for the top bearing. (steps 10-12)
15) Install new bottom bearing plate, replace bottom bearing cover.
16) Insert the new or repaired shaft. Running clearance between shaft and new bearing must be about .001". Shaft must rotate freely in bearing.
17) Re-position rubber insulating ring - use adhesive if possible. Re-install top casting. Make sure that the evaporator lugs are properly seated against shoulders machined in casting. If steel spacers are found between evaporator lugs, they should be re-used in the same position. These are required to obtain proper alignment. Tighten the four mounting bolts evenly.
18) Shaft must rotate freely by hand. If shaft is tight, it indicates that the top casting is off center.
19) Install ice blade and adjust clearance to approximately .003" at closest point. Refer to blade adjustment instructions.
20) Re-install bottom half of the flexible coupling.
21) Re-install speed reducer and motor.
22) Re-install stainless steel jacket.

REPLACEMENT OF MAIN BEARINGS 5 – 10 TON MODELS

Bearing replacement on large capacity machines is accomplished without removing the shaft from the flaker.

1 Turn ice flaker off and pump down until all ice is removed from the evaporator.

2 Shut main disconnect off and lock out power.

3 Remove speed reducer and drive motor from machine (leave flexible coupling on until later). The flexible coupling will help to keep the shaft from dropping when the bottom bearing retainer is removed.

4 The bottom bearing retainer and bottom bearing cover are attached to the bottom casting via (4) 5/16" bolts. Remove the (4) bolts from the cover & retainer. Once the bearing cover is removed, you will see the bottom bearing retainer and the end of the shaft. There are two threaded holes on the retainer, install two of the removed bolts into these threaded holes, turning each one an equal amount to "jack" the retainer out of its normal position on the bottom casting.

5 When the retainer is removed, the old bearing can be pressed out of the aluminum retainer.

6 There is a stainless steel shaft sleeve between the shaft and the bearing, the shaft sleeve will probably come off the shaft with the bearing and retainer. If it did not, then remove the sleeve from the shaft (it is kept in place with only a keyway, there is no set screw. It will slide freely, but rotate with the shaft).

7 Press the new bearing into place, it should be centered in the retainer.

8 The new seals can then be pressed into place, the auxiliary seal is placed inside the main seal.

9 Place the new shaft sleeve on the shaft and install the bearing retainer (with new bearing & oil seals installed) and bottom bearing cover. Align the bolt holes with the threaded hole in the casting and re-install the (4) mounting bolts, taking care to tighten them equally so the retainer goes in straight.

10 Remove the flexible coupling from the flaker shaft, then remove the (4) 5/16" bolts holding the top bearing retainer in place.

11 Repeat steps 4-9 for the top bearing & retainer removal, the only difference is there is no bearing plate on the top bearing, instead, there are seals on the top, and on the bottom of the bearing all seal are to be installed with the seals positioned to keep the grease in the bearing area.

12 Rotate the shaft to check for clearance before re-installing the drive assembly.

13 Re-install the flexible coupling, gearbox and drive motor.

14 Remove power lockout and turn flaker on. Check rotation and amp draw prior to opening the liquid solenoid valve.

15 If all seems to be in order, open (energize) the liquid solenoid valve and allow the machine to start making ice.

16 Discard the first bin ½ bin of ice and clean & sanitize the bin prior to using ice for consumable products.

REPLACEMENT OF ELECTRIC EYES (ICE LEVEL CONTROL)

1. Turn off the main power and remove the 11-pin power module.
2. Locate the sensor to be replaced, and remove the sensor housing cover (if present).
3. Using two open-ended wrenches, and placing one on the back nut and one on the forward nut, remove the sensor.
4. Disconnect the sensor from the terminal strip (under the relay base).
5. Connect the replacement sensor to the terminal strip. (Connect black wire from receiver only to terminal marked “Black”).
6. Install the sensor in the mounting bracket, and tighten the locknuts.
7. Re-install the power module into the base.
8. Turn on main power.
9. Check alignment of the sensors. When proper alignment is achieved, the LED on the receiver will light. Adjust the mounting brackets as necessary to ensure that the sensors are properly aligned.
10. Reinstall the sensor housing covers (if applicalble).

REPLACEMENT OF WATER PUMP

Turn off the main power to the flaker, Remove screws holding the stationary sump cover, loosen and remove water tube fitting (Nylon compression fitting), remove the cover from the electrical junction box, disconnect the water pump wires from the terminal strip. Lift the water pump (with cover attached) off the sump. Remove the water tube hose and clamp. Loosen and remove four (4) nuts which hold the pump onto the sump cover; the pump can then be removed from the cover.

Installing the new pump, simply reverse the above procedure. Use caution when routing the new cables to insure they are secured to avoid accidental damage.

REPLACEMENT & ADJUSTMENT OF WATER FLOAT VALVE

Turn off main power to ice flaker.
Shut off the water supply to the ice flaker and drain the supply line. Loosen and remove the compression fitting at the float valve. While holding the float valve body with a pliers or crescent wrench, remove the water float valve fitting from the valve body. Using a 13/16" socket (a spark plug wrench works well), remove the locking nut from the valve body, (you may need to hold the valve body to keep it from turning). Remove the old valve and fibre washer. Install new valve (with fibre washer on the inside of the water sump), tighten the locking nut with the socket. The valve body should be held in place with the discharge port facing straight down. Re-install the float valve fitting. Reattach water supply line. Turn on water shut off valve and check for leaks at the compression fitting and at the float valve fitting. The water level should be maintained just below the lower edge of the water return trough while the flaker is operating. To adjust the operating level, hold the float in one hand, and push or pull on the brass shaft (depending on whether the water level is too high or too low.) Watch the operation for a while to verify the water level. If the water level is still not where it should be, re-adjust the float.

REPLACEMENT OF EXPANSION VALVE

Pump down the ice flaker and evacuate refrigerant from the liquid line. Carefully cut back the insulation on the suction line and remove the remote bulb. The bulb is secured to the suction line with two straps. Loosen and remove flare nuts on the expansion valve and remove the old valve. Install the new valve and

tighten the flare nuts. Re-attach the bulb to the suction line, at approximately 5 o-clock position. Secure the bulb using two straps. Re-insulate the suction line. Using a high quality vacuum pump, evacuate the liquid line to remove any moisture that may have entered the system while the line was open to atmosphere.

ADJUSTMENT OF EXPANSION VALVE

If ice freezes on surface of evaporator (top to bottom) but harvests only the upper portion with each revolution of the shaft *and* there are no bubbles in the sight glass, then the expansion valve must be adjusted. (opened, to feed more refrigerant). On the other hand, frost on the compressor body indicates that the valve is overfeeding.
Remove the adjustment stem cover and turn the adjustment stem 1/8 to 1/4 turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve if the evaporator was not harvesting ice on its entire length.) Wait 5-10 minutes between each adjustment to allow the valve to stabilize. Repeat this step until ice is produced and harvested all the way down to the bottom of the evaporator. Note: *Balanced Port Expansion Valves Are more sensitive than normal TXV's, so adjustment of the stem should be limited to between 1/16 to ⅛ turn at a time.*

***** SPECIAL NOTE *****

ON SINGLE CIRCUIT MACHINES WITH DUAL TXV VALVES, (101E-1, 76E-1, 75E, 100E) CLOSE BOTH VALVES, AND OPEN BOTH EQUALLY 1/4 TO ½ TURN EACH UNTIL ICE IS MADE AND HARVESTED ON THE ENTIRE LENGTH OF THE EVAPORATOR. WAIT 5-10 MINUTES BETWEEN EACH ADJUSTMENT.

***** SPECIAL NOTE *****

REPLACEMENT OF SOLENOID VALVE

***** SPECIAL NOTE *****

On flakers SUPPLIED WITH HOWE CONTROL PANELS that are connected to a central refrigeration rack system, a jumper wire must be placed between terminal "Line $_A$" and terminal "L_2". This jumper will allow the solenoid valve to energize when the operating circuit is energized.

***** SPECIAL NOTE *****

Pump down the ice flaker and evacuate refrigerant from the liquid line. Turn off main power to ice flaker, disconnect wires leads from solenoid valve and remove armored cable. Loosen and remove flare nuts (or unsolder) on the solenoid valve and remove the old valve. Install the new valve and tighten the flare nuts (or re-solder).

***** CAUTION *****

ARROW ON THE SOLENOID VALVE MUST POINT IN DIRECTION OF FLOW TOWARDS ICE FLAKER

***** CAUTION *****

Using a high quality vacuum pump, evacuate the liquid line to remove any moisture that may have entered the system while the line was open to atmosphere. Re-connect armored cable and solenoid wires. Turn on main power, turn on ice flaker switch and check operation of solenoid valve

HOWE

Revised - July 2005

Table	Description
1	Cross section drawing for 2000-6000 pound ice flaker
2	Repement parts for 2000-6000 pound ice machines
4	Cross section drawing for 5-10 ton ice flaker
	Replacement parts for 5- 10 ton ice machines
5	Replacement parts for electric control panel, & misc. Accessories
6	Replacement Expansion Valves

Please have model number and serial number of
ice flaker ready when ordering replacement parts.

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Website: www.howecorp.com

Models 2000, 10EA, 10EAR, 11ES, 11ESS, 3000, 15EA, 15EAR
16ES, 16ESS, 4000, 20EA, 20EAR, 21ES, 21ESS, 6000, 30EA
30EAR, 31ES, 31ESS ICE FLAKERS
CROSS-SECTION

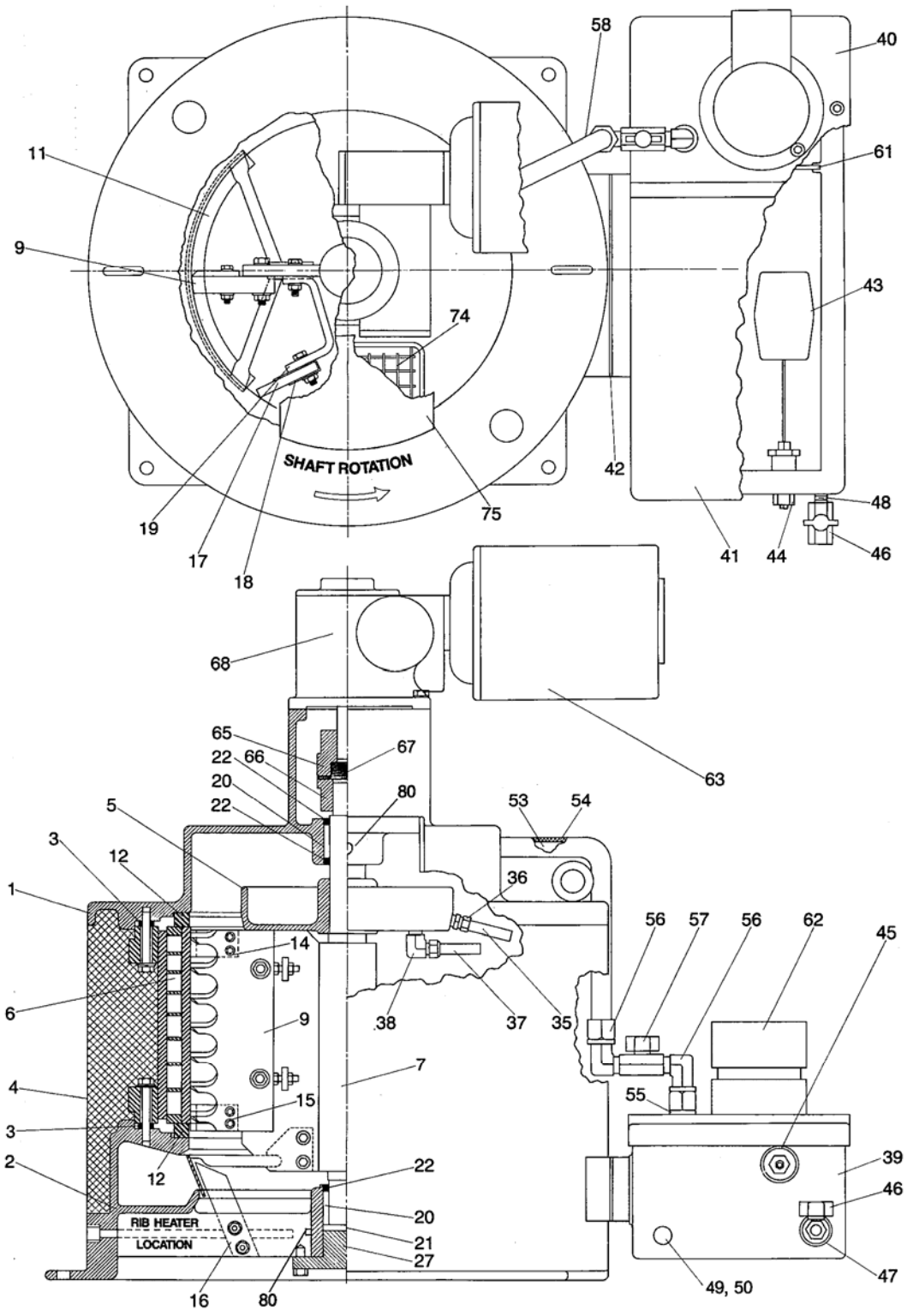


TABLE 3: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	PART DESCRIPTION	PART NUMBER			
3	Insulated Lug Spacers (8)	E20J4			
7	Main Shaft	E10D2	E15D2	E20D2	E30D4
9	Ice Blade 8½" L, 12½" L, 20½" L	E10E2	E20E2		E30E3
9a	Nuts, bolts & washers (Ice Blade)	E10E5	E20E6		E30E5
	Ice Blade Adjustment Gauge kit. Set of five feeler gauges for ice blade adjustment.	E10E15			
11	Ice deflector	E10G1		E20G2	
11a	Nuts, bolts & washers (ice deflector)	E20G5			
12	Insulating Ring (2)	E10J1		E20J1	
14 or 15	Top or bottom auxiliary ice scraper (2)	E20E4			
15a	Nuts, bolts & washers (aux. Ice scraper)	E20E7			
16	Ice deflector scraper	E20G4			
17	Squeegee 8½" L, 12½" L, 20½" L	E10F4	E20F4		E30F3
18	Squeegee wrapper	E10F9	E20F9		E30F8
18a	Nuts, bolts & washers (squeegee wrapper)	E10F8	E20F8		E30F22
19	Squeegee bracket	E10F11	E15F6	E20F11	E30F7
19a	Squeegee Bracket (Seawater)	E10F7	E15F7	E20F21	E30F21
20	Main shaft bearings (2)	E20K1			
21	Bottom bearing thrust plate	E20K2			
22	Main bearing grease seals (3)	E20K3			
22a	Bearing replacement kit (2 bearings, 1 plate & 3 seals)	E20K4			
22b	Bearing removal / replacement tool kit	E10T1			
27	Bottom bearing cover	E10B8		E20B8	
35 & 36	Water distribution side spout & fitting	E10H18 (6)	E20H39 (6)	E20H39 (7)	E30H8 (7)
	Water distribution side spout & fitting ***(For use on plastic distribution pan)***	E10H18-P (6)	E20H39-P (6)	E20H39-P (7)	N/A
36a	Water Distribution pan assembly (includes dist. Tubes/fittings) ***(Plastic Pan / Tubes)***	E10H51		E20H44	N/A
36a	Water Distribution pan assembly (includes dist. Tubes/fittings) ***(Aluminum Pan / Copper Tubes)***	N/A		N/A	E30H9
36a	Seawater Distribution pan. ***(Aluminum Pan with Split cover) (tubes not included)***	E10H14-S			
37 & 38	Water distribution bottom spout / fitting	E10H17		E20H38	
	Water distribution bottom spout / fitting ***(for use on plastic distribution pan).***	E10H17-P		E20H38-P	
39a	Water sump assembly (includes water pump)	E10H31			E30H7
40	Water Sump bolt down cover (New Style, Flat plate)	E10H31-2			N/A
40	Water sump bolt-down cover (old style, Cast Aluminum)	E10H20			E20H9
41	Water sump removable cover (old style Large sump)	E10H21			H20H10
	Seawater sump anti-splash baffle	E20H42			
42	Water sump gasket	E20J2			
	Water sump silicone adhesive	E20J6			
43	Water float valve E10h29 (round float) 6" arm [1] E50H18 (rectangular float) 11" arm [1]	E10H29			E50H18
	Water Float Valve Assembly (*Shipboard freshwater or seawater & land based seawater*) [1]	E50H18			
	Water float Valve Circular - 5" arm (old style) [1]	E20P1			
44	Water float valve fitting	CNB-BR02/06			CNBHF-SG-BR08
53	Water tube	E10H7		E20H30	E30H3
	Water tube insulation	E10H9		E20H14	E30H4
55	Water tube grommet	E20H19			
56	Water tube fitting (2)	ELM-CT-NY10/08			
57	Water tube regulating valve	E20H24			
60	Water tube sleeve	E20H12			
61	Water sump screen	-			E20H13
62	Water pump 115-230/1/60 [1]	E30Q1			
	Water pump 230/1/60[1]	E10Q1			-

TABLE 3: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	PART DESCRIPTION	PART NUMBER			
	Water pump 230/1/60 [1]	E10H32			-
	Water pump 230/1/60 [1] With Molex plug, (for RLE models only)	E10H32-P		-	-
62a	Water pump retrofit kit Replaces old style side mounted 230/1/60	E10H31			E30H7
62b	Water pump - seawater 115-230/1/50-60	E20Q5			
63	Drive motor 115-230/1/60, ⅓HP, ½HP	E20M1			E30M1
	Drive motor 110-220/1/50, ⅓HP, ½HP	E20M10			E30M3
	Drive motor 208-230-460/3/50-60 ½HP	E20M2			
	Drive motor 230/1/60 TEFC (for seawater) (1/3, ½ hp)	E20M3			E30M2
	Drive motor 380/3/50 ⅓HP, TEFC (for seawater)	E20M5			
65,66,67	Flexible coupling – complete (for use with gearmotor)	E10N5		N/A	
	Flexible coupling - complete (for use with gearbox)	E10N4		E20N9	
67a	Flexible coupling key for shaft.	E20N10			
	Flexible coupling for gearmotor	E10N5	-	-	-
	Gearmotor (for RLE model) 60 Cycle	F5M2	-	-	
	Gearmotor (for RLE model) 50 Cycle	F5M3	-	-	
	Gear motor adaptor plate	E10A6	-	-	
68	Speed reducer for 60cy. 920 MDVD 750:1	E10R6		-	
	Speed reducer for 50cy. 920 MDVD 600:1	E10R5		-	
	Speed reducer for 60cy. 926MDVD 600:1	-		E20R4	
	Speed reducer for 50cy. 926MDVD 450:1	-		E20R3	
75a	Handhole cover (bolt down)	E10A5		E20A6	
	Replacement rib heater element (3)	HT150/240-RLE			
	Speed Reducer oil (natural)	SR-OIL			
	Speed Reducer oil (synthetic)	SR-OIL-SYN			

[1] To help determine which ice flaker water float valve & water pump you need, use the following tables.

Water Pumps:

Flaker Manufacture Date		Replacement Water pumps for Freshwater ice flakers			
Start Date	End Date	2000 Pound models	3000 pound models	4000 pound models	6000 pound models
-0-	07/86	*	*	*	*
07/86	01/91	E30Q1	E30Q1	E30Q1	E30Q1
01/91	07/94	E10Q1	E10Q1	E10Q1	E30Q1
07/94	present	E10H32	E10H32	E10H32	E30Q1
2000-RLE & 3000-RLE use replacement pump part # E10H32-P pump with Molex plug installed.					
* replacement sump assm.		E10H31	E10H31	E10H31	E30H7

Float Valves:

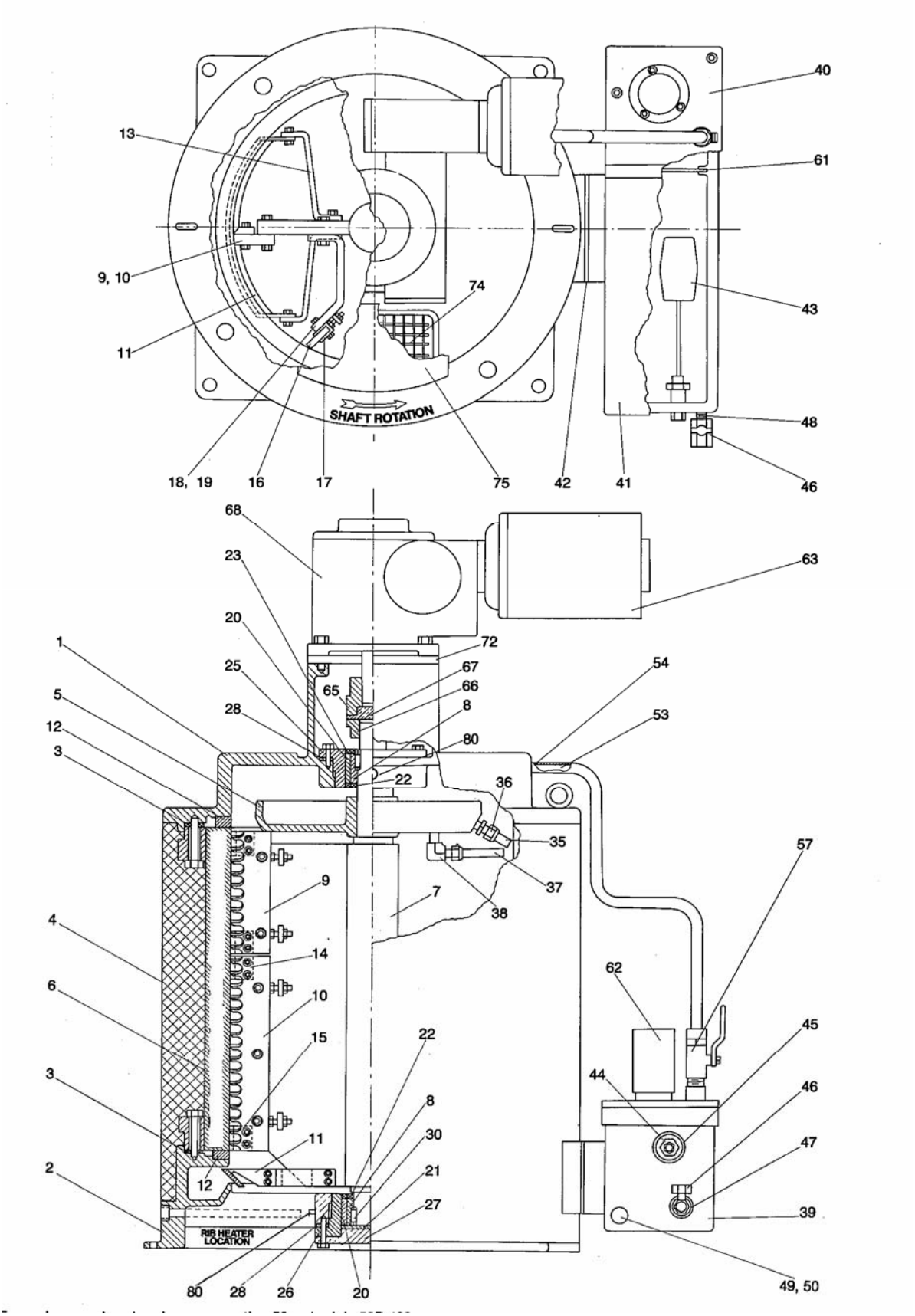
Flaker Manufacture Date		Replacement Water float valves for Freshwater ice flakers			
Start Date	End Date	2000 Pound models	3000 pound models	4000 pound models	6000 pound models
-0-	07/86	E20P1	E20P1	E20P1	E20P1
07/86	01/91	E50H18	E50H18	E50H18	E50H18
01/91	07/94	E10H29	E10H29	E10H29	E50H18
07/94	present	E10H29	E10H29	E10H29	E50H18

For more detailed information, contact Howe customer service department with ice flaker serial number.

Speed Reducer field replacement parts are no longer available. Speed reducers can be sent into factory to be rebuilt.

See our website http://www.howecorp.com/speed_reducer.htm **or Contact Howe for information on rebuilding speed reducers.**

Models 51E, 50EA, 50EAR, 76E-1, 76E-2
75EA, 75EAR, 101E-2, 101E-2, 100EA, 100EAR
FRESHWATER ICE FLAKERS
CROSS-SECTION


40
13
61
9, 10
74
43
11
SHAFT ROTATION
48
18, 19
16
17
75
42
41
46
68
63
23
20
72
1
25
67
54
65
66
5
28
8
53
12
80
3
22
36
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57
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14
62
6
10
45
15
22
44
3
8
46
30
11
47
2
21
12
27
39
RIB HEATER LOCATION
49, 50
80
28
26
20

TABLE 4: Replacement Parts for Models Listed to Right		50E, 51E 50EA, 50EAR	75E, 76E 75EA, 75EAR	100E, 101E 100EA, 100EAR
Item No.	PART DESCRIPTION	PART NUMBER		
3	Insulated lug spacers (8)	E50J2		
7	Main shaft	E50D1	E75D1	E100D1
8	Shaft sleeve	E50D2		
9	Top ice blade 20½" L, 12½"L, 20½"L	E30E3	E20E2	E30E3
9a	Nuts, Bolts & washers (top ice blade)	E30E5	E20E6	E30E5
10	Bottom ice blade	-	E30E3	
10a	Nuts, Bolts & washers (bottom ice blade)	-	E30E5	
	Ice Blade Adjustment Gauge kit. Set of five feeler gauges for ice blade adjustment.	E10T15		
11	Ice deflector blade	E50G5		
11a	Nuts, Bolts & washers (ice deflector)	E50G8		
12	Insulating ring (2)	E50J1		
12a	Insulating ring adhesive - ½ pint	7V033		
13	Ice deflector bracket (2)	E50G9		
14 or 15	Top & Bottom auxiliary ice scraper (2)	E20E4		
15a	Nuts, Bolts & washers (aux. Ice scraper)	E20E7		
16	Squeegee	E30F3	E75F3	E100F3
17	Squeegee wrapper	E30F8	E75F4	E100F4
17a	Nuts, Bolts & washers (squeegee wrapper)	E30F22	E75F8	E100F8
18	Top squeegee bracket	E50F1	E75F1	E50F1
19	Bottom squeegee bracket	-	E50F1	
20	Main shaft bearings (2)	E50K1		
21	Bottom bearing thrust plate	E50K2		
22 & 23	Main bearing grease seal (3)	E50K13		
25	Top main bearing retainer	E50K3		
25a	Top bearing replacement kit (includes bearing, 2-seals, shaft sleeve.	E50K10		
26	Bottom main bearing retainer	E50K4		
26a	Bottom bearing replacement kit (includes bearing, 1-seal, shaft sleeve.	E50K11		
27	Bottom bearing cover	E50K5		
28	Main bearing pull-out washer (2)	E50K6		
35 & 36	Water distribution side spout & fitting (11)	E50H19		
37 & 38	Water distribution bottom spout & fitting	E50H31		
40	Water sump bolt down cover	E50H11		
41	Water sump removable cover	E50H15		
42	Water sump gasket	E50J3		
43	Water float valve	E50H18		
44	Water float valve fitting	CNBHF-SG-BR08/08		
53	Water tube	E50H22	E75H4	E100H1
54	Water tube insulation	E50H32	E75H2	E100H2
55	Water tube valve brass nipple	NPBR-075/CL		
56	Water tube fitting	CNM-SG-BR14/12		
57	Water tube regulating valve	E50H24		
	Water pump 230-460/3/50-60	E50Q1		
	Water pump 220-230/1/50-60	E50Q2		
62	Water pump 575/3/60	E50Q9		
	Drive motor 208-230-460/3/50-60 1 HP O.D.P.	E50M1		
	Drive motor 115-230/1/50-60 ¾ HP, 1 HP O.D.P.	E50M2		
	Drive motor 208-230-460/3/50-60 1 HP TEFC	E50M4		
	Drive motor 220/-380/3/50 TEFC	E50M5		
	Drive Motor 208-230/1/60 1 HP, TEFC	E50M6		
	Drive Motor 110/200-220/1/50 1 HP, TEFC	E50M7		
63	Drive motor 220/-380/3/50 O.D.P.	E50M9		
63A	Drive motor key	E50M8		
65,66,67	Flexible coupling - complete	E50N1		
	Speed reducer 60 cycle	E50R1-935		
68	Speed Reducer 50 Cycle	E50R2-935		

TABLE 4: Replacement Parts for Models Listed to Right	50E, 51E 50EA, 50EAR	75E, 76E 75EA, 75EAR	100E, 101E 100EA, 100EAR
Item No.	PART DESCRIPTION	PART NUMBER	
75	Handhole cover removable	E50A2	

Table 5: Electric Panel Parts & Misc.

Part Description	Part No.
Complete control panel (2 light)	E20T40-RL
Complete control panel (6 light)	E20T40-SCA
Control Transformer 230 VAC primary, 24 VAC secondary	E20T31
Solid state control board	E20T48
Overload reset button (N.O.)	E20T23
On-Off rocker switch	E20T24
4-Pole Contactor **24 VAC coil** for flaker drive motor	E20T44
230VAC Single pole, Double throw relay	E20T45
Relay base / socket for above	E20T46
2 Amp Fuse (600 Volt) (2- required)	E20T49
Fuse Holder (2 required)	E20T52
Disconnect Switch (DSC1)	E20T53
Drive motor starter with overload (M1/M1-DSC)	E20T54
Pump motor starter with overload (M2/M2-DSC)	E20T55
10 Amp single pole circuit breaker (CB1)	E20T56
Red oil tight indicating lamp (2) (LP1, LP2)	E20T57
Green Oil tight indicating lamp. (LP3)	E20T58
Oil tight On/Off switch (SW1)	E20T59
Off delay timer (TMR1)	E20T61
DPDT Mini Relay (R1)	E20T62
Relay Socket Base for Timer/Relay	E20T63
Relay socket base for Mini Relay	E20T64
Drive Motor Contactor with Overload Relay	E20T54
Water Pump Contactor	E20T72
Control Transformer 480v Pri, 240v Sec. 300VA	E20T74
Ice Flaker initiate relay	E20T62
Water pump run relay	E20T62
Mini relay base	E20T46
Off delay timer	5V012
timer base	5V013
3 amp fuse (600V)	CCMR-3
2 amp fuse (600 V)	CCMR-2
2 Amp fuse (250V)	KLDR-2
Fuse Holder	E20T52
Photo eye ice level control, Power module (230 VAC)	E10U28-3
Photo eye ice level control, receiver	E10U28-2
Photo eye ice level control, emitter	E10U28-1
Photo eye ice level control mounting bracket kit	E10U42-K
Photo Eye ice level control kit (relay & sensors with 20”cords & Molex plug)	E20T73
Photo Eye ice level control kit (relay & sensors with 15’cords, no Molex plug)	E20T73-L
Photo Eye ice level control, Power supply relay	E20T68
Photo Eye ice level control relay base	5V013
Photo eye ice level sensor, Emitter (20” cord with Molex plug)	E20T69
Photo eye ice level sensor, receiver (20” cord with Molex plug)	E20T70
Photo eye ice level sensor, Emitter (15’ cord with no plug)	E20T69-15NP
Photo eye ice level sensor, receiver (15’ cord with no plug)	E20T70-15NP
Photo eye mounting Brackets (Set of two)	E10U44
Green 230 VAC	LGX-2
Amber 230 VAC	LAN-2
Red 230 VAC	LRN-2
Green 24 VAC	LGX-24
Amber 24 VAC	LAN-24
USDA bearing lubricant	E20K6
Replacement water filter (1000# flakers only) (core inserts)	E10H56
Replacement water filter (2000-20,000 # flakers, 1-6 required depending on model) (Core inserts)	E10H57
Replacement 20 micron water filter cartridge (quick dis-connect type cartridges)	E10H43
Replacement 20" water pre-filter core (Core inserts)	E10H46
Replacement Pre-filter housing cover (20" blue)	E10H45
Replacement Sodium pellets for Salt doser (40 pound bag)	E10H58
Ice Machine Cleaner	E10V1

Table 6: Replacement Expansion Valves (for Freshwater flakers)

Ice Flaker Model	R-404A		R-22	
	Standard	Balanced Port	Standard	Balanced Port
	Part #	Part #	Part #	Part #
1000	F5V18	F5V20	F5V17	F5V19
2000	E10V23	E10V25	E10V22	E10V24
3000	E15V6	E15V7	E15V5	E10V24
4000	E20V11	E15V7	E20V10	E20V12
6000	E30V6	E30V7	E30V5	E20V12
10,000	E50V6	E50V6	E50V5	E50V7
15,000	E75V3	E75V5	E75V2	E75V4
20,000	(2) E50V6	(2) E50V6	(2) E50V5	(2) E50V7

Refrigeration Requirement - SEAWATER

ICE FLAKER MODEL No.	Units	Seawater Temperature			
		50°F / 10°C	60°F / 15.6°C	70°F / 21.1°C	80°F / 26.7°C
10ES, 11ES, 11ESS	**BTU/hr**	**14,000**	**15,000**	**16,000**	**17,000**
	Kcal/hr	3,530	3,780	4,030	4,285
15ES, 16ES, 16ESS	**BTU/hr**	**21,000**	**22,500**	**24,000**	**25,500**
	Kcal/hr	5,295	5,670	6,025	6,428
20ES, 21ES, 21ESS	**BTU/hr**	**28,000**	**30,000**	**32,000**	**34,000**
	Kcal/hr	7,060	7,560	8,060	8,570
30ES, 31ES, 31ESS	**BTU/hr**	**42,000**	**45,000**	**48,000**	**51,000**
	Kcal/hr	10,590	11,340	12,100	12,850
50ES, 51ES, 51ESS	**BTU/hr**	**70,000**	**75,000**	**80,000**	**85,000**
	Kcal/hr	17,640	18,900	20,160	21,420
75ES, 76ES, 76ESS	**BTU/hr**	**105,000**	**112,500**	**120,000**	**127,500**
	Kcal/hr	26,460	28,350	30,240	32,130
100ES, 101ES, 101ESS	**BTU/hr**	**140,000**	**150,000**	**160,000**	**170,000**
	Kcal/hr	35,300	37,800	40,300	42,850